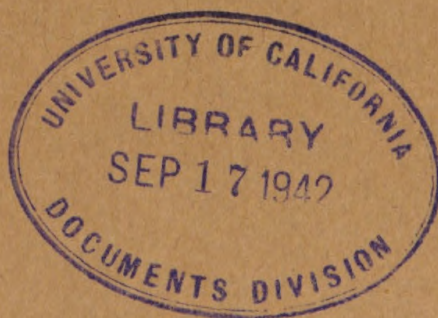


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U.S. Dept. of Army
WAR DEPARTMENT
TECHNICAL MANUAL

37-MM AIRCRAFT GUN
MATÉRIEL M4

March 30, 1942



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37-MM AIRCRAFT GUN MATERIEL M4

CHANGES
No. 1

WAR DEPARTMENT,
WASHINGTON, November 26, 1942.

TM 9-240, March 30, 1942, is changed as follows:

31. Recuperator.

* * * * *

NOTE—Rescinded.

a. Where it is impossible to obtain oil, recoil, light, U. S. Army Specification 2-36D, for use in the recuperator of the gun, automatic, 37-mm, M4 (aircraft), one of the following mixtures may be used until oil, recoil, light, becomes available.

(1) Mixture of equal parts by volume of liquid, aircraft compass, U. S. Army Specification 2-57B (Army-Navy Aeronautical Specification AN-VV-C-551) and oil, lubricating, for aircraft instruments and machine guns, U. S. Army Specification 2-27E.

(3) Mixture of equal parts by volume of liquid, aircraft compass, U. S. Army Specification 2-57B (Army-Navy Aeronautical Specification AN-VV-C-551), and fluid, hydraulic (petroleum base), Air Corps Specification 3580, latest issue. *Caution:* In this mixture, fluid, hydraulic (castor oil base) Air Corps Specification 3580, cannot be substituted for fluid, hydraulic (petroleum base).

b. The products described above are for emergency use only, and should be removed as soon as the prescribed product, oil, recoil, light, becomes available. Under no conditions will the components of the substitute mixtures be added individually to the recuperator. When either of these mixtures is used in an emergency, the prescribed components must be placed in a suitable container in the proportions listed and thoroughly mixed by stirring before putting the mixture into a recuperator. Any of these components will mix permanently with each other, but such mixing is best accomplished at normal room temperature above 60° F. It is absolutely essential that the components and the mixture be free of all dirt and moisture. Care must therefore be taken that the

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mixing is done in a dust- and moisture-free atmosphere, in a clean, dry container, using clean mixing implements.

[A. G. 062.11 (10-16-42).] (C 1, Nov. 26, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
*Major General,
The Adjutant General.*

re, in:

TECHNICAL MANUAL }
No. 9-240 }

WAR DEPARTMENT,
WASHINGTON, March 30, 1942.

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37-MM AIRCRAFT GUN MATÉRIEL M4

SECTION		Paragraph
I. General.		
	Scope-----	1
	Data-----	2
	Cautions-----	3
II. Description and functioning.		
	Description-----	4
	Functioning-----	5
III. Operation.		
	Loading 30-round magazine and gun-----	6
	Withdrawing partially expended endless belt-----	7
	Unloading gun (any magazine)-----	8
	Loading 15-round articulated link belt-----	9
	Loading 15-round magazine-----	10
	Loading gun from 15-round magazine-----	11
	Withdrawing partially expended 15-round magazine-----	12
IV. Disassembly and assembly.		
	30-round magazine-----	13
	Tube-----	14
	Back plate-----	15
	Breechblock-----	16
	Lock frame-----	17
	Tube extension-----	18
	Feed box parts-----	19
	Ejection chute-----	20
V. Disassembly and assembly of groups.		
	Lock frame-----	21
	Tube extension-----	22
	Driving spring-----	23
	Back plate-----	24
VI. Inspection.		
	Procedure-----	25
VII. Malfunction and correction.		
	Malfunction and correction-----	26

*This manual supersedes TM 9-240, April 10, 1941.

SEC. VIII. Care and preservation.

Paragraph

General.....	27
Inspection.....	28
Removal of parts with gun mounted in airplane.....	29
Lubrication instructions.....	30
Recuperator.....	31
Cleaning.....	32
Cleaners and abrasives.....	33
Preservatives.....	34

IX. Ammunition.

General.....	35
Classification.....	36
Identification.....	37
Model.....	38
Ammunition lot number.....	39
Ammunition data card.....	40
Painting and marking.....	41
Care, handling, and preservation.....	42
Authorized rounds.....	43
Preparation for firing.....	44
Packing.....	45

X. Organization spare parts and accessories.

Organization spare parts.....	46
Accessories.....	47

APPENDIX. List of references.....	Page 40
-----------------------------------	------------

SECTION I

GENERAL

Scope.....	Paragraph 1
Data.....	2
Cautions.....	3

1. **Scope.**—*a.* This manual is published for the information and guidance of the using arms and services.

b. In addition to a description of the 37-mm automatic gun M4, this manual contains technical information required for the proper use, care, and identification of the matériel.

c. Disassembly, assembly, and such repairs as may be handled by using arms personnel will be undertaken by any capable armorer.

d. In all cases where the nature of the repair or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed in order that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

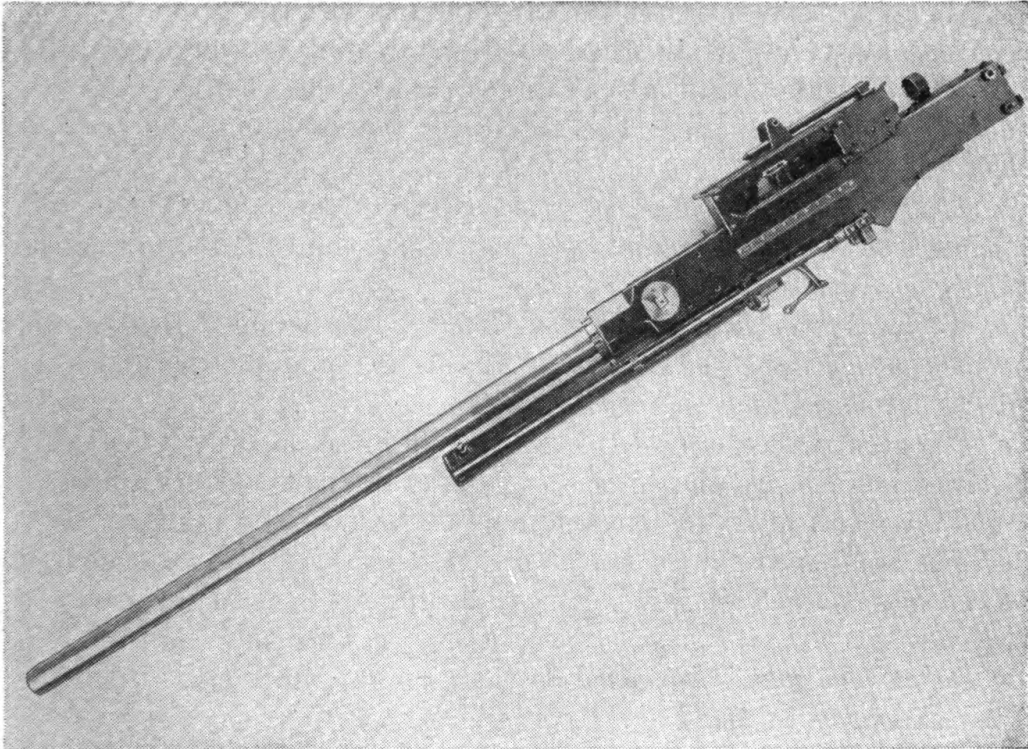


FIGURE 1.—37-mm aircraft gun M4—left side.

2. Data.—a. Gun.

(1) Caliber, 37-mm or 1.457 inch.	
(2) Weight of gun without magazine-----pounds--	213
(3) Weight of 30-round magazine-----do-----	35. 5
(4) Weight of 30-round magazine loaded----do----	93. 4
(5) Weight of 15-round magazine-----do-----	12. 5
(6) Weight of 15-round magazine loaded----do----	41. 5
(7) Weight of tube-----do-----	55
(8) Over-all length of gun-----inches--	89
(9) Length of tube-----do-----	65
(10) Muzzle velocity-----feet per second--	2, 000
(11) Cyclic rate of fire-----shots per minute--	125-150
(12) Capacity of recoil mechanism-----ounces--	42. 75

b. Ammunition.

- | | |
|--|--|
| (1) Weight of one round-----pounds-- | 1. 93 |
| (2) Weight of 20 rounds in packing box-----do---- | 61 |
| (3) Dimensions of 20-round packing box----inches-- | |
| | 15 $\frac{1}{8}$ by 11 $\frac{1}{16}$ by 13 $\frac{7}{32}$ |

3. Cautions.—Most aircraft guns differ from other guns in that because of their inaccessibility during flight, there is no possibility of their being serviced after the airplane has left the ground. It is therefore most important that an aircraft gun be very carefully cleaned, lubricated, and placed in working order before it is assembled in the airplane. The following points should be scrupulously observed:

a. All preservatives must be removed from the gun. To do this it is necessary to disassemble the entire mechanism, including the driving spring assemblies.

b. Whenever the tube is removed from or reassembled to the gun, the lock frame must be retracted. If this is not done, the extractor will be deformed and rendered useless.

c. The recuperator must be filled with light recoil oil, U. S. Army Specification No. 2-36D, to the proper level (par. 31). Failure to do so may result in severe damage to gun, airplane, and pilot.

d. The recuperator must not be disassembled except by authorized ordnance personnel, since it is very difficult to reassemble properly in the field.

e. Before the gun is installed in the airplane, its action should be tested carefully by hand.

SECTION II

DESCRIPTION AND FUNCTIONING

Description-----	Paragraph 4
Functioning-----	5

4. Description.—The 37-mm automatic gun M4 is an aircraft weapon. It uses the energy of recoil to load, fire, and eject projectiles automatically. It consists of two distinct parts, recoiling and nonrecoiling. The recoiling portion is composed of tube, tube extension, recuperator piston rod, lock frame, and lock frame driving spring assemblies. The nonrecoiling portion consists of the trunnion block assembly, feed box assembly, and recuperator cylinder (fig. 2).

5. Functioning.—The functioning of the various members during the firing cycle is as follows (fig. 30):

a. When the firing button is pressed by the operator, it causes the solenoid on the top cover at the rear of the trunnion block to pull the trigger. The trigger pulls the trigger bar, rotating the top of the trigger lever to the rear. At the same time the breechblock, in battery position, elevates the front end of the trigger trip and depresses the rear. This forces the trigger lever connector, which is pivoted at the center of the trigger lever, to the rear. The combination of

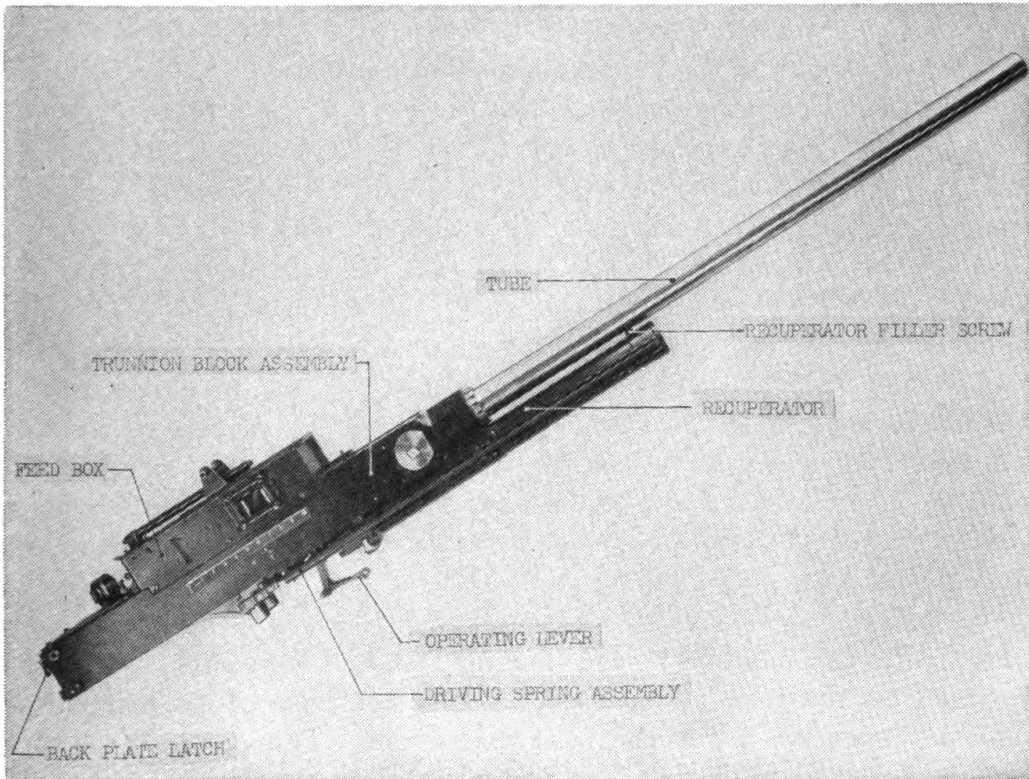


FIGURE 2.—37-mm aircraft gun M4—right side.

these two conditions, the elevation of the breechblock and the pulling of the trigger, causes the trigger connector to press the sear rearward. The sear rotates out of engagement with the hammer, which is driven forward by its spring until it strikes the firing pin. The firing pin strikes the primer and the propelling charge is ignited.

b. When the cartridge fires, the recoiling parts are all driven rapidly backward. They move as a unit for approximately $9\frac{5}{8}$ inches, after which the counterrecoil of the tube and tube extension is begun by the recuperator. The lock frame and driving spring rods continue to move rearward until the lock frame strikes the buffer and

is caught and held by the carrier dog. Most of the energy of recoil is absorbed by the recuperator.

c. At about one-half the recoil distance, the operating lever, the forward part of which has been engaged in a slot in the breechblock, is rotated by cams. This action forces the breechblock downward until it rests on the breechblock stop. Consequently the breech is open, so that when the lock frame and tube extension separate, the extractor draws the empty cartridge case out of the chamber. As the tube extension moves forward, the rear end of the ejector is cammed upward by the ejector operating stud on the lock frame (held back by the carrier dog). Thus the forward end of the ejector is forced downward, striking the empty case and knocking it out the open under side of the trunnion block.

d. As the tube extension moves forward, a stud on its right side rotates the feed lever forward. Rotation of the feed lever is transferred to movement of the feed slide through the feed lever swivel, feed lever crank, and the feed slide lever. The feed slide moves in toward the right of the feed box (looking forward), carrying with it the feeder clip and consequently the next round to be fired. As the new round approaches the center of the feed box, it is cammed downward by the stripper cam on the feed box frame. At the same time it strikes the carrier catch, pushing the catch to the right and releasing the carrier. The carrier snaps down, hitting the round to help force it downward, and at the same time disengaging the carrier dog from the lock frame. The released lock frame is impelled forward by its driving springs, and as it travels its forward end rams the cartridge into the chamber. The spring-actuated extractor, which is mounted on the lock frame, slips around the base of the cartridge case and engages it for the next extraction. The operating lever, moving forward with the lock frame, engages the breechblock and forces it upward into closed position.

e. The gun is now ready to fire when the trigger is pulled.

SECTION III

OPERATION

	Paragraph
Loading 30-round magazine and gun.....	6
Withdrawing partially expended endless belt.....	7
Unloading gun (any magazine).....	8
Loading 15-round articulated link belt.....	9
Loading 15-round magazine.....	10
Loading gun from 15-round magazine.....	11
Withdrawing partially expended 15-round magazine.....	12

6. Loading 30-round magazine and gun.—*a.* Remove the feed door from the magazine.

b. Retract the lock frame (fig. 3).

c. Press one round of ammunition into the spring clip nearest the right side of the feed box (fig. 4). Make sure that the groove in the rotating band of this and of every other projectile engages the mating projection of the spring clip.

d. Pull back the loading handle, thus moving the belt one clip, and fill the next clip which emerges from the feed box.

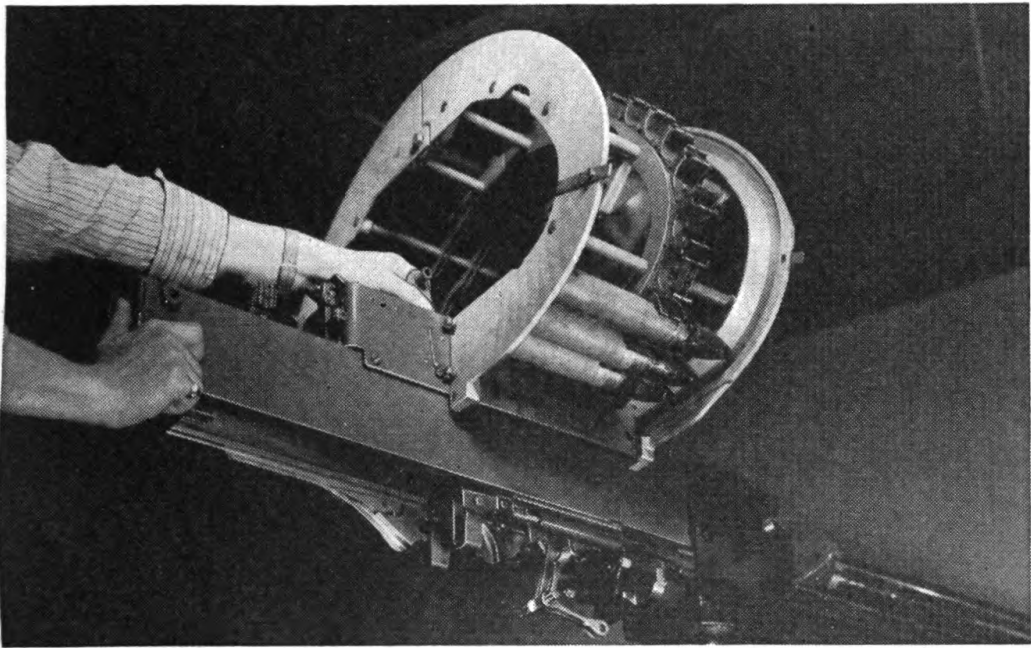


FIGURE 3.—Retracting loading handle.

e. Continue filling the clips and moving the belt until 30 rounds have been inserted, when the resistance to further motion of the belt will indicate that loading is complete.

NOTE.—If the loading handle is inaccessible, it is possible to move the belt directly by hand, provided the feed box cover is removed and the feed pawl lifter stud and the cartridge feeder stop pawl are held released.

7. Withdrawing partially expended endless belt.—*a.* Remove the feed box cover (fig. 24).

b. Holding the feed pawl lifter stud and the cartridge feeder holding pawl released, guide the belt out the left side of the feed box.

8. Unloading gun (any magazine).—Retract the lock frame, thus ejecting a live round.

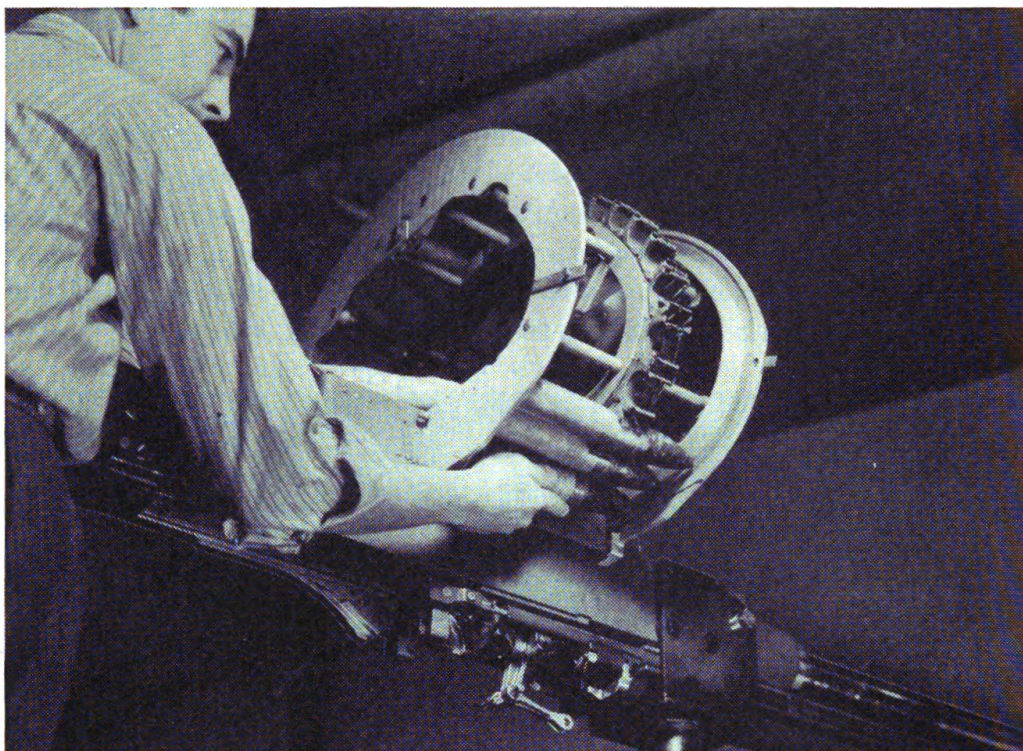


FIGURE 4.—Loading 30-round magazine.

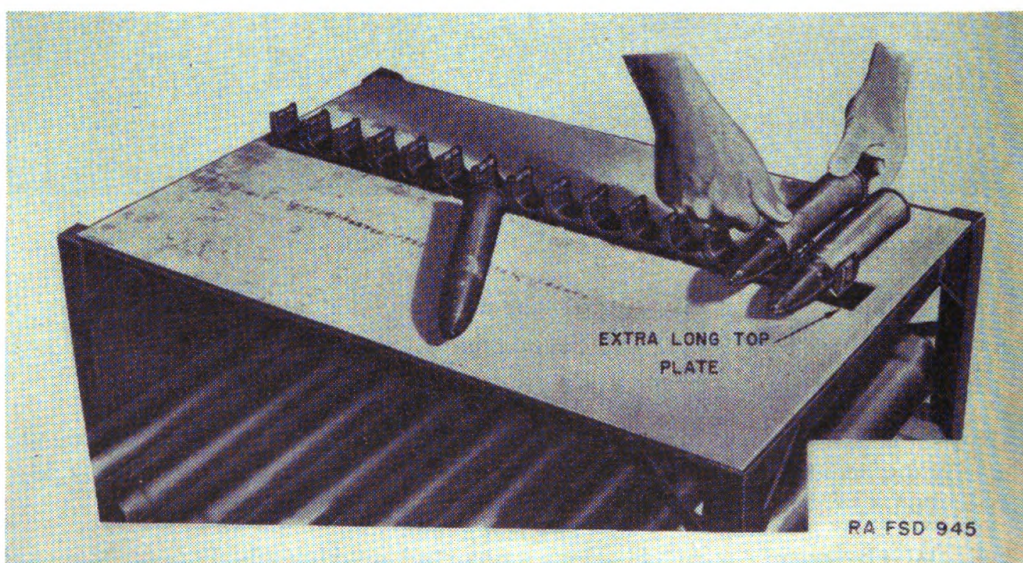


FIGURE 5.—Belt, loading, 15-round link, 37-mm automatic gun M4.

9. Loading 15-round articulated link belt.—*a.* Place the link belt on a flat surface with the spring clips upward and with the long end of the top plate to the left of the operator (fig. 5).

b. With the noses of the projectiles forward, press a round of ammunition into each spring clip so that the grooves in the rotating bands of the projectiles engage mating projections on the spring clips. See that the bases of the cartridge cases are in alignment.

10. Loading 15-round magazine.—*a.* Attach the magazine loading tray to the magazine.

b. With the magazine on the left of the operator, turn the belt end-for-end and upside down, so that the noses of the projectiles are pointing away from the operator, the long end of the top plate is to the right of the operator, and the projectiles are downward.

c. While holding the belt holding pawls disengaged with the left hand, lift the belt and slide the left end into the magazine as far as it will go freely, making sure that the top plate of the first round engages the link guide of the magazine (fig. 6).

d. Continue loading the belt into the magazine until the belt holding pawls are in position to engage between the first and second rounds which will enter the gun (these are the last and next to last to enter the magazine) (fig. 7).

e. Remove the loading tray.

11. Loading gun from 15-round magazine.—*a.* Mount the magazine on the feed box, and attach the ejection chute to the right side of the feed box (fig. 8).

b. Move the belt into the gun so that the feeder pawl enters a depression in the first link.

c. Retract the lock frame.

d. Pull the loading handle twice to the rear. The gun is now ready to fire when the lock frame comes forward.

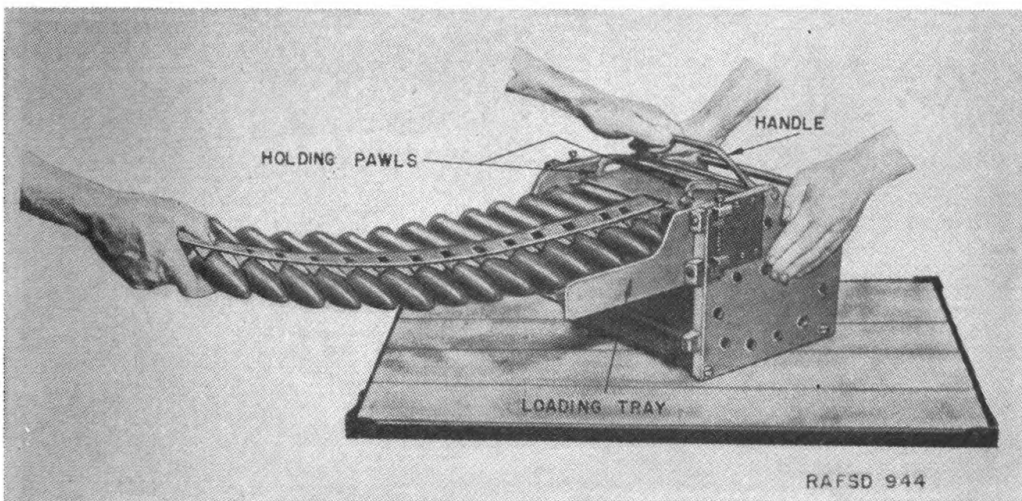


FIGURE 6.—Belt, loading, 15-round link in magazine, 37-mm automatic gun M4.

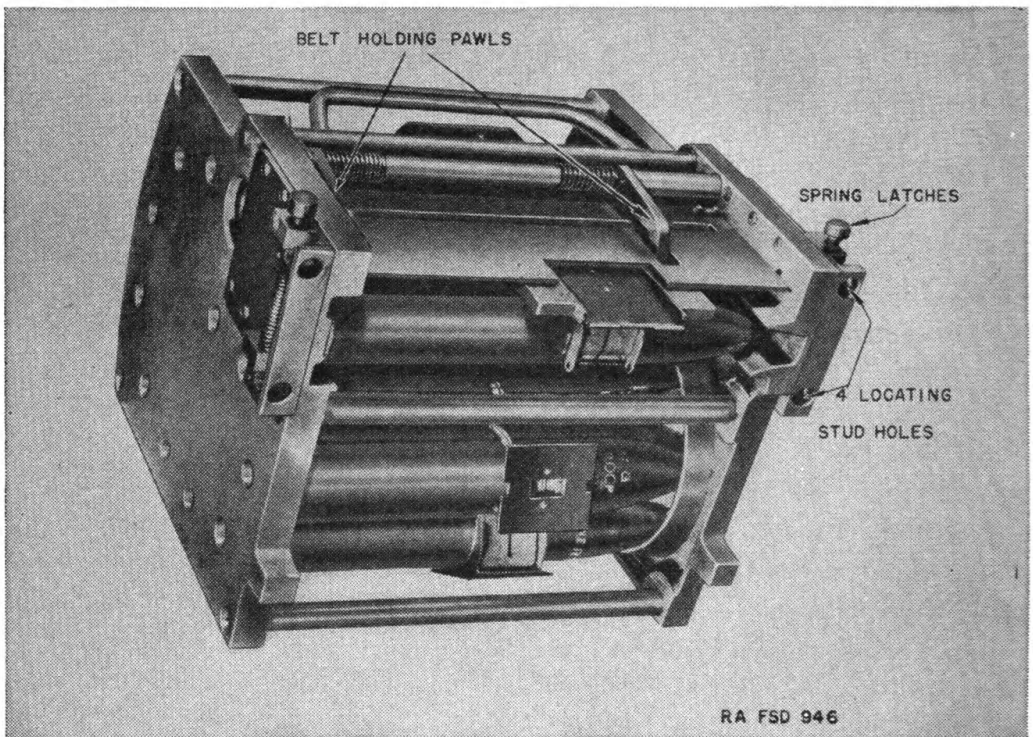


FIGURE 7.—Magazine, 15-round, loaded, 37-mm automatic gun M4.

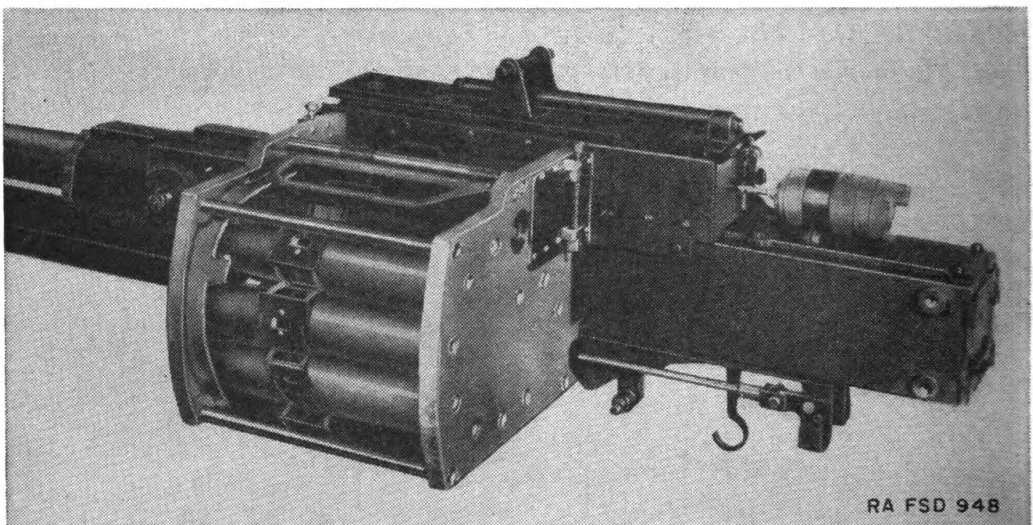


FIGURE 8.—Magazine, left side, showing 15-round attached and trigger solenoid in place.

12. Withdrawing partially expended 15-round magazine.—

a. Remove the feed box cover. Holding the feeder holding pawl released and the feeder pawl lifter stud depressed, push the links of the articulated belt backward through the feed box until they are entirely in the magazine.

b. Depress the spring latches and lift away the 15-round magazine.

SECTION IV

DISASSEMBLY AND ASSEMBLY

	Paragraph
30-round magazine.....	13
Tube.....	14
Back plate.....	15
Breechblock.....	16
Lock frame.....	17
Tube extension.....	18
Feed box parts.....	19
Ejection chute.....	20

13. 30-round magazine.—*a. To remove.*—(1) Release the dogs on the feed door and release the feed door (fig. 13).

(2) Unscrew the screw joining the two links of the endless belt which are marked in red (fig. 9).

(3) Holding the cartridge feeder stop pawl released, guide the endless belt out the feed doorway.

(4) Separate the two halves of the magazine by removing the two bolts joining the right to the left half at the top (fig. 10).

(5) Depress the spring latches, and pull away the left half (fig. 12).

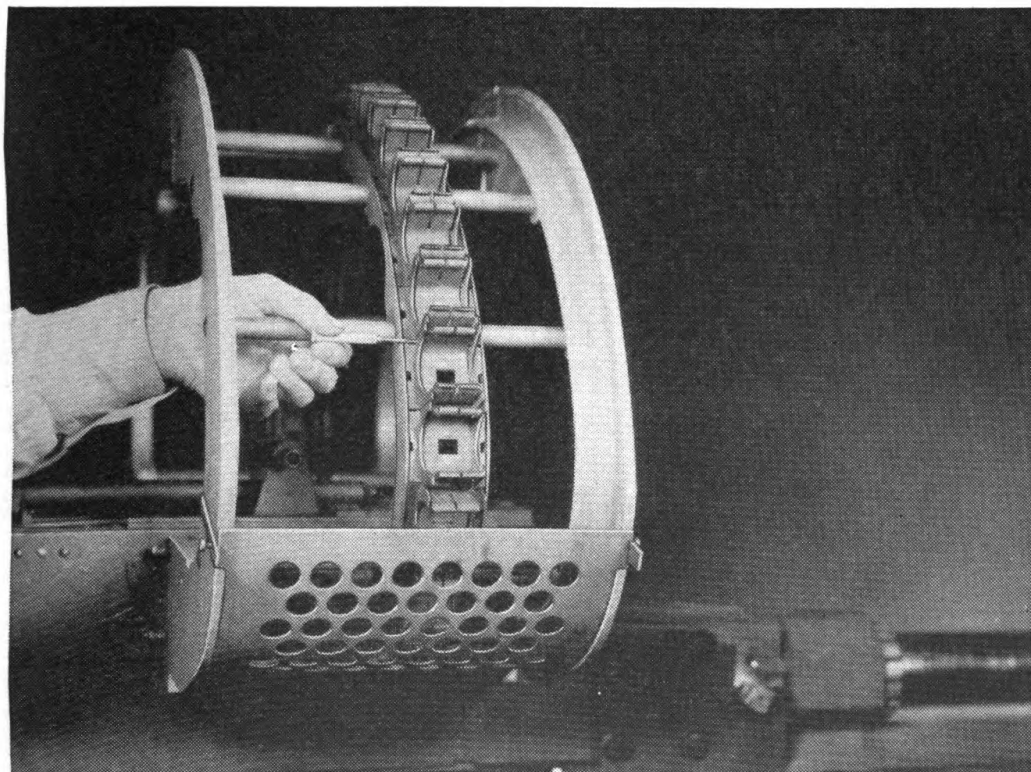


FIGURE 9.—Removing screw from endless belt.

(6) Remove the cotter pins from the knurled head pins holding the right half.

(7) Withdraw rearward the pins holding the right half to the feed box, and pull away the right half (fig. 11).

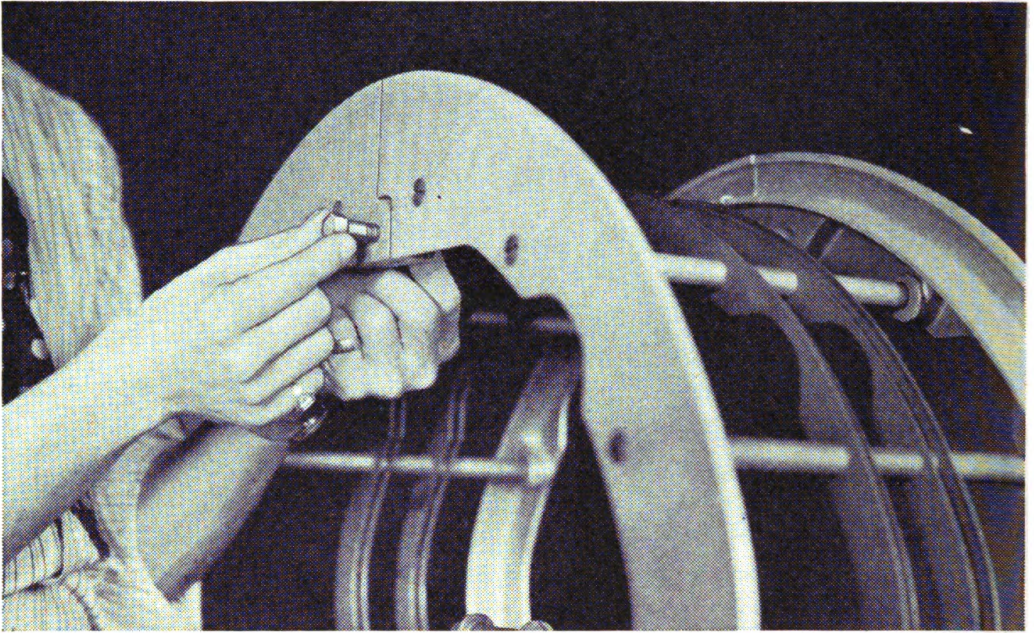


FIGURE 10.—Removing bolt joining halves of 30-round magazine.

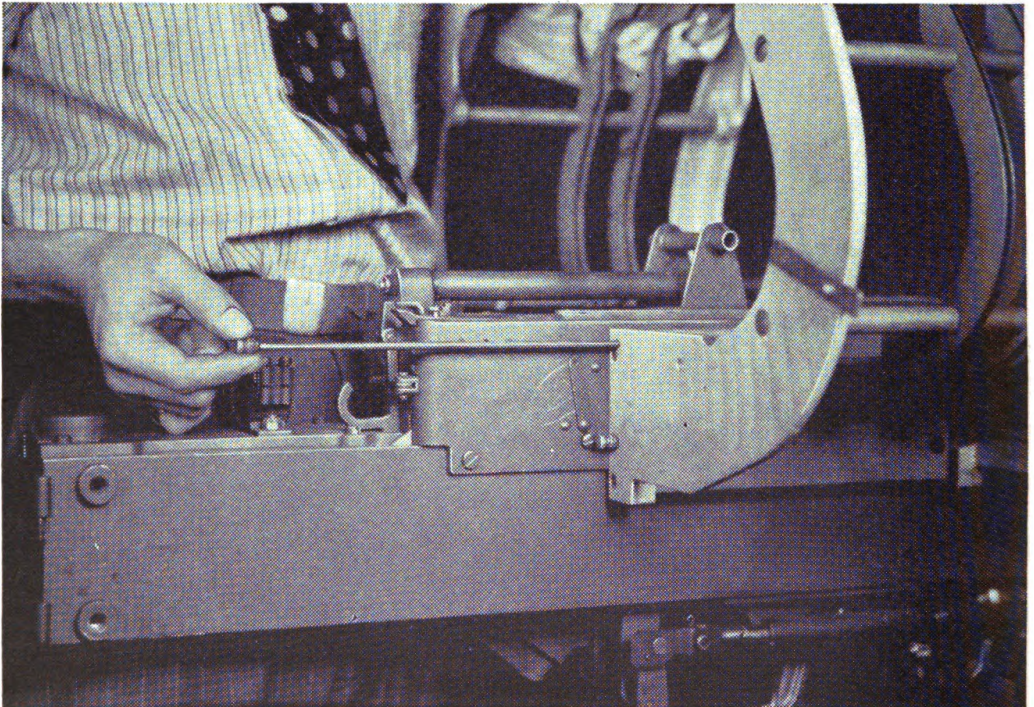


FIGURE 11.—Removing bolts holding 30-round magazine to feed box.

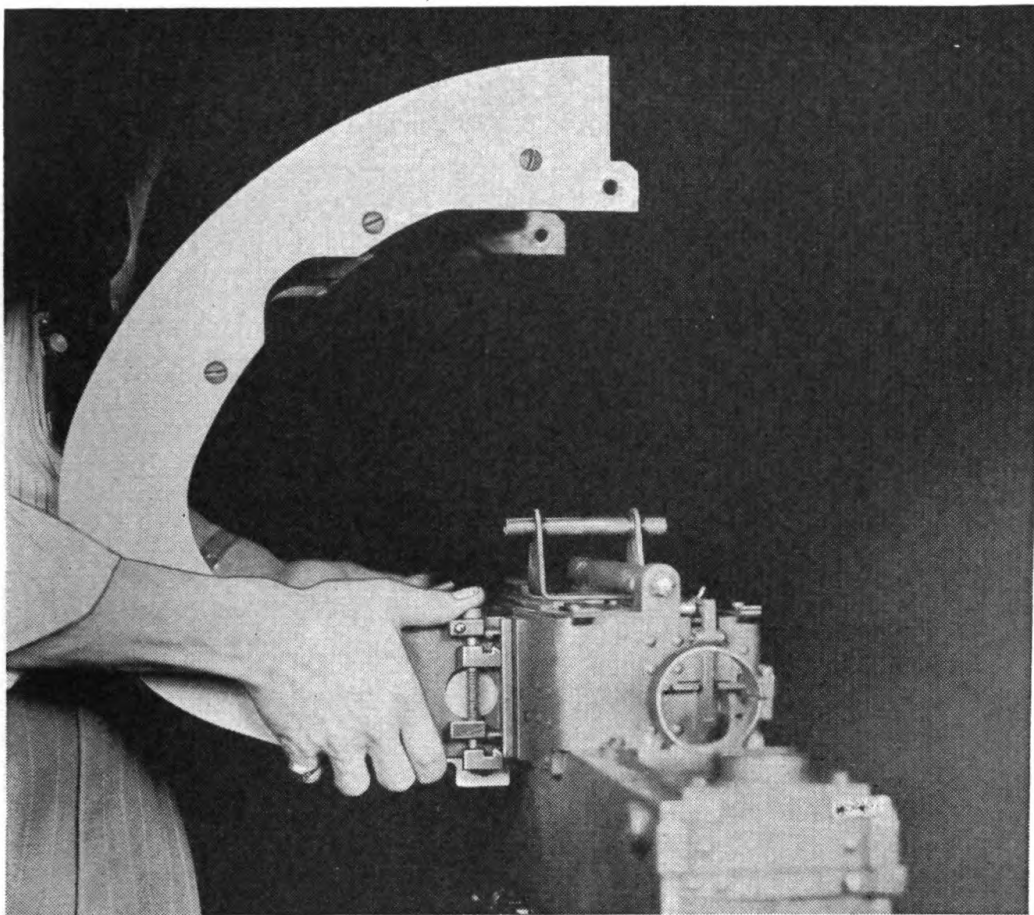


FIGURE 12.—Removing left half of 30-round magazine.

b. To replace.—(1) Place the right half in position on the feed box, and insert pins and cotter pins.

(2) Place the left half in position on the studs of the feed box, making sure that the latches are engaged.

(3) Insert the two bolts joining the right to the left half of the magazine.

(4) Guide the endless belt into its place on the track, holding the cartridge feeder stop pawl released while moving it through the feeder box.

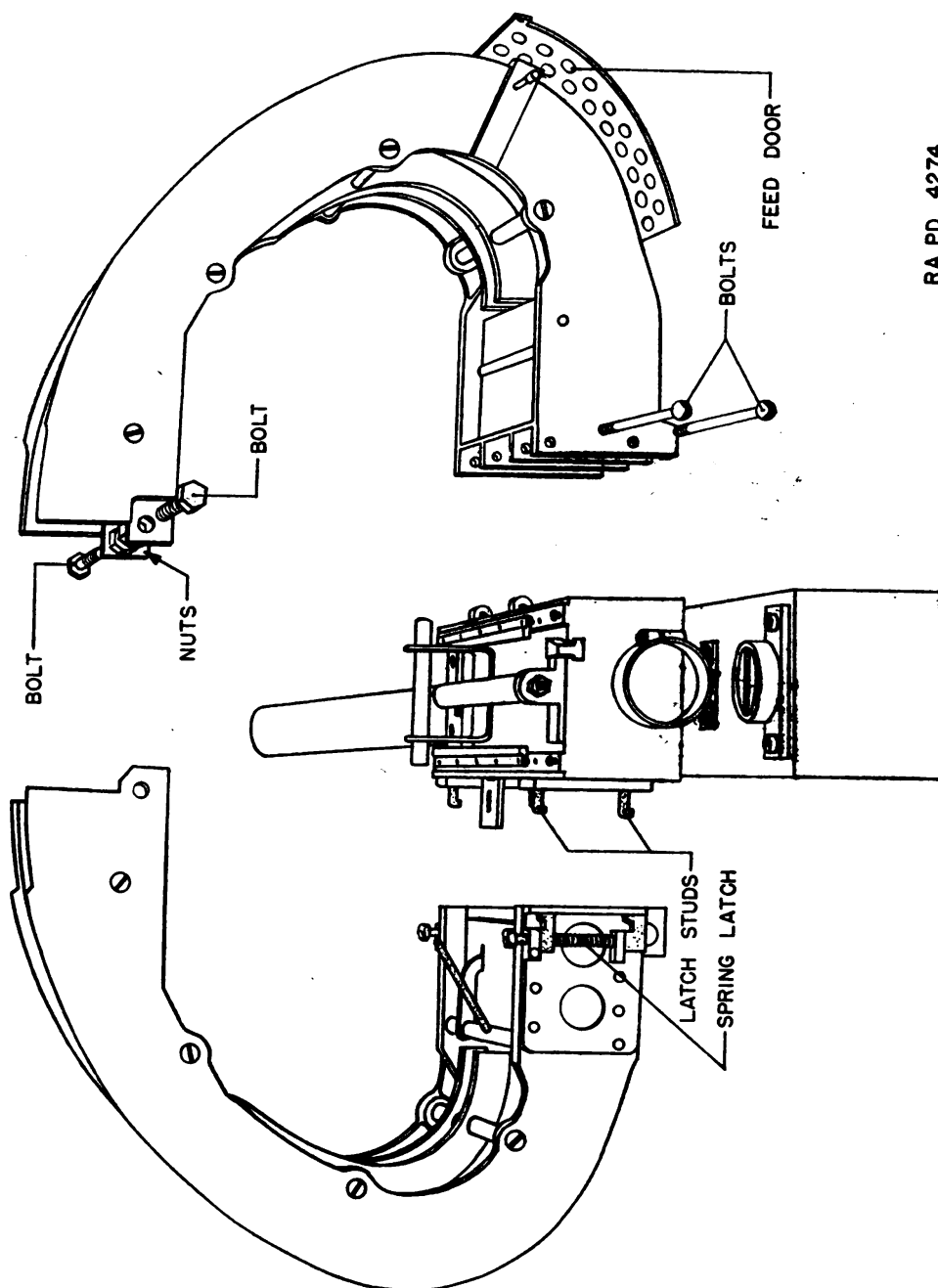
(5) Insert the screw joining the two lengths of the belt marked in red.

(6) Replace the feed door.

14. Tube.—*a. To remove.*—(1) Retract the lock frame.

(2) Unscrew the trunnion block bushing until the threads are disengaged from the trunnion block (fig. 15).

(3) Keeping the tube lock depressor pushed to the rear (fig. 14), unscrew the tube counterclockwise five turns.



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FIGURE 13.—Disassembly of 30-round magazine.

(4) Pull out the tube. The trunnion block bushing will be pushed forward and out by the shoulder of the tube. It should then be removed by inserting a screw driver in its slot and separating its two halves.

b. To replace.—(1) Reassemble the trunnion block bushing on the tube.

(2) Retract the lock frame.

(3) Screw the tube into the extension by hand until it stops.

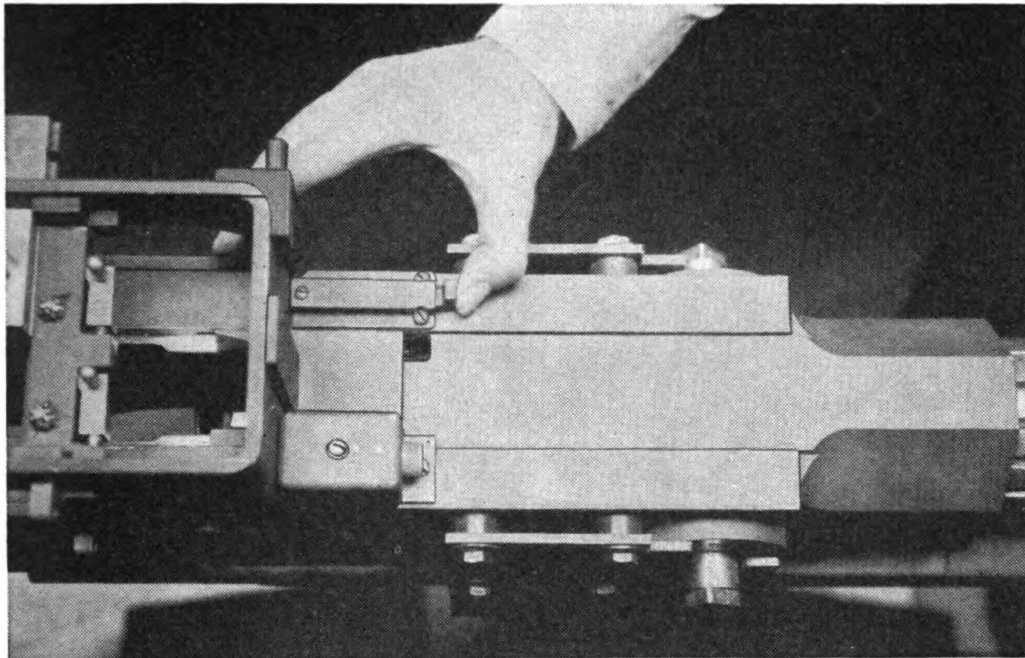


FIGURE 14.—Depressing tube lock depressor.

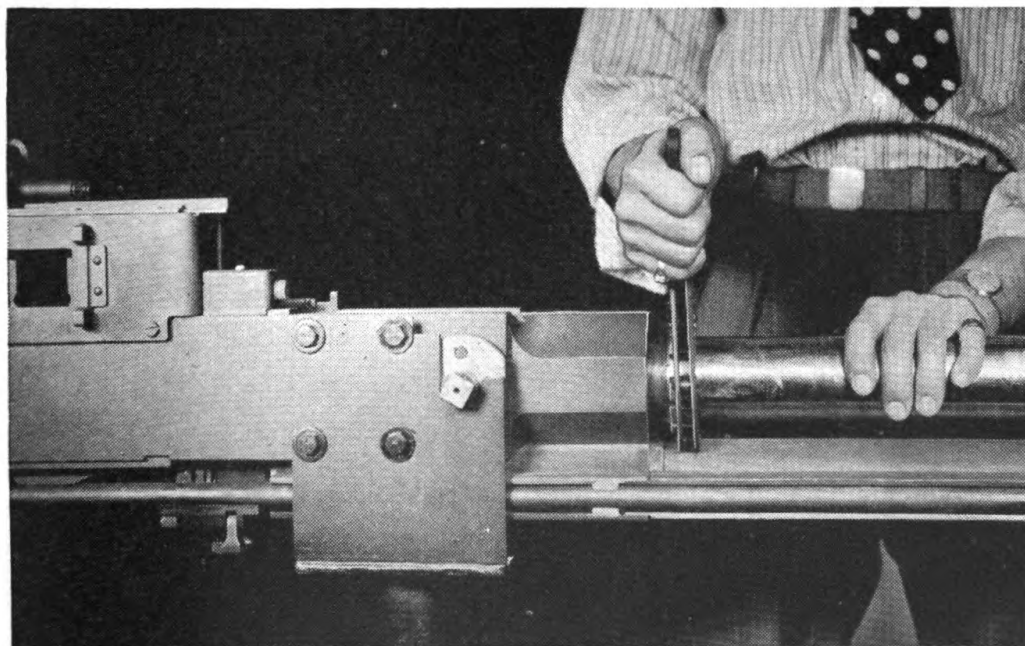


FIGURE 15.—Unscrewing trunnion block bushing.

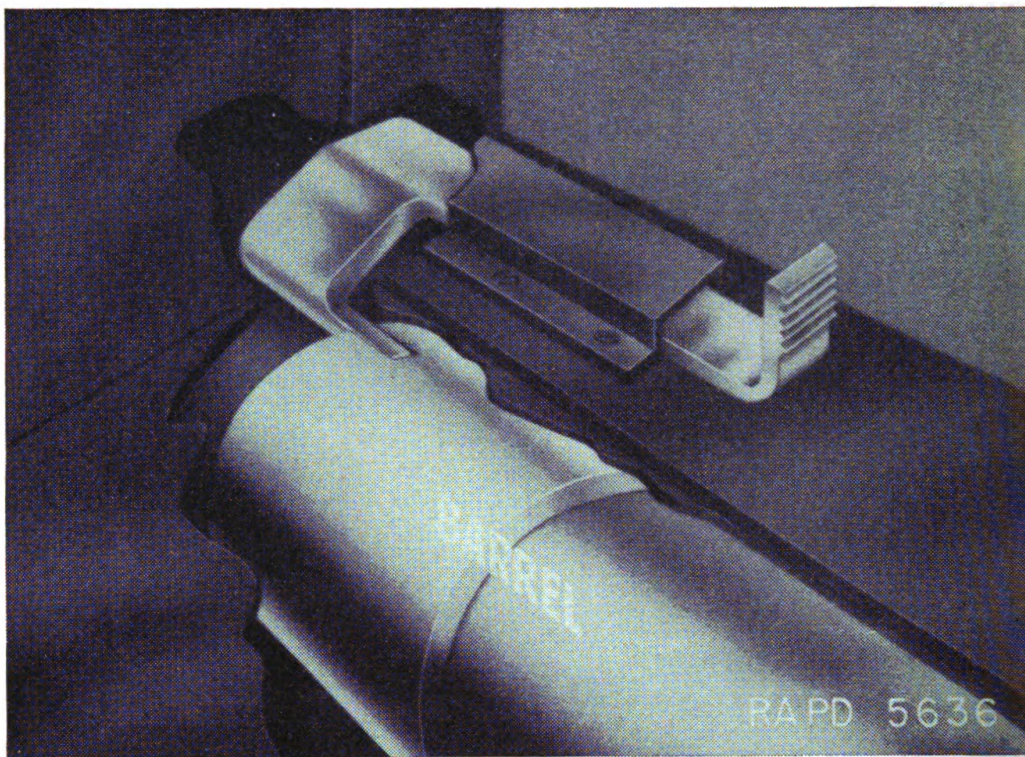


FIGURE 16.—Tube lock.

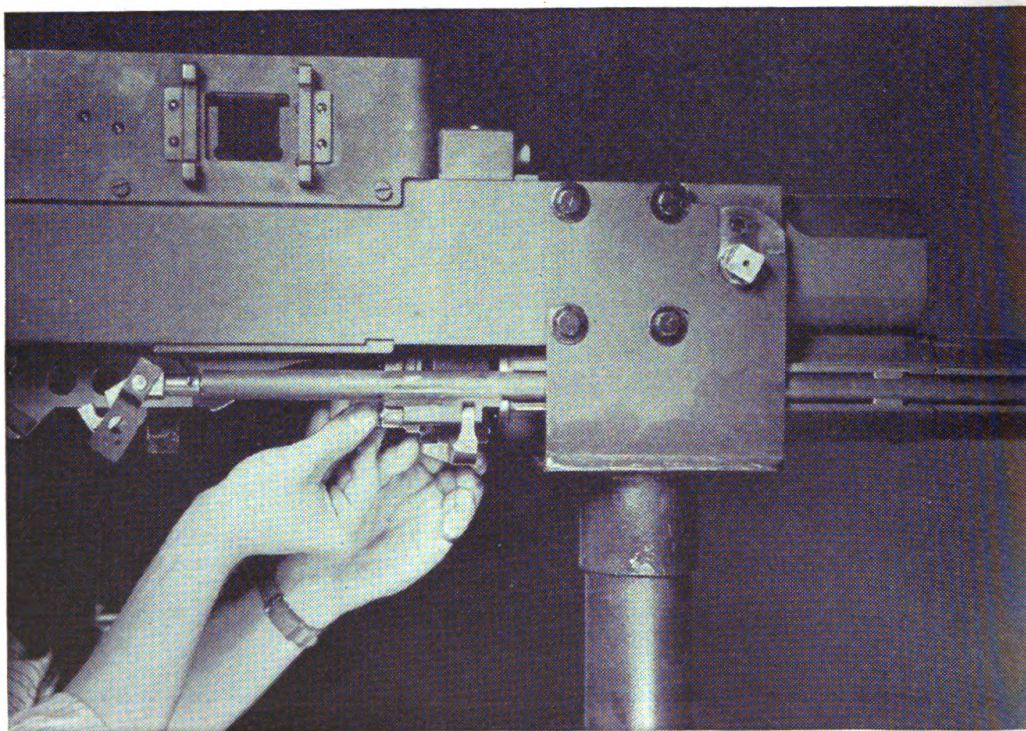


FIGURE 17.—Removing breechblock.

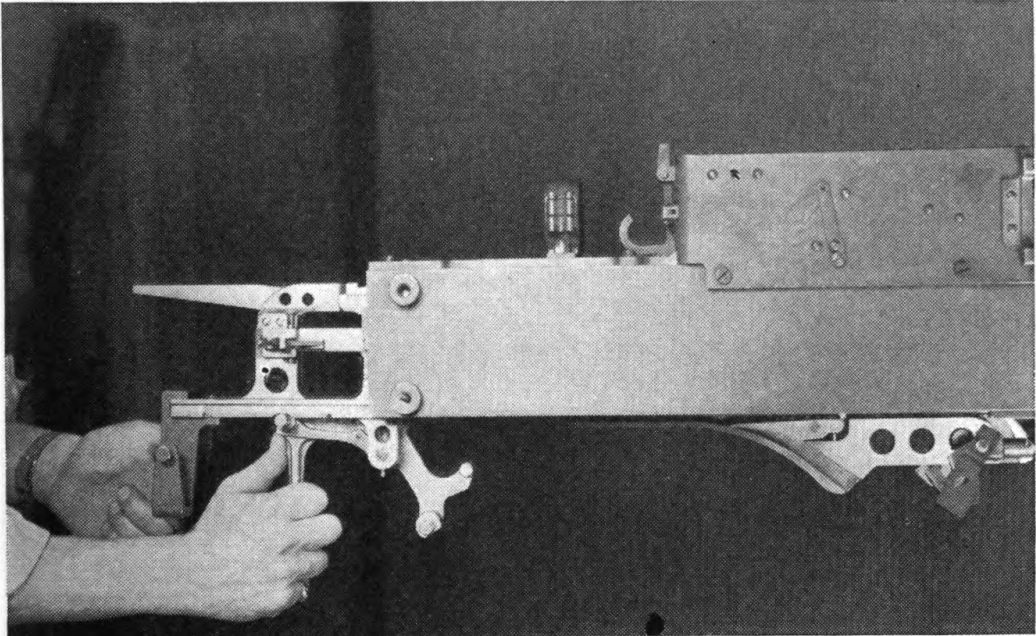


FIGURE 18.—Removing lock frame.

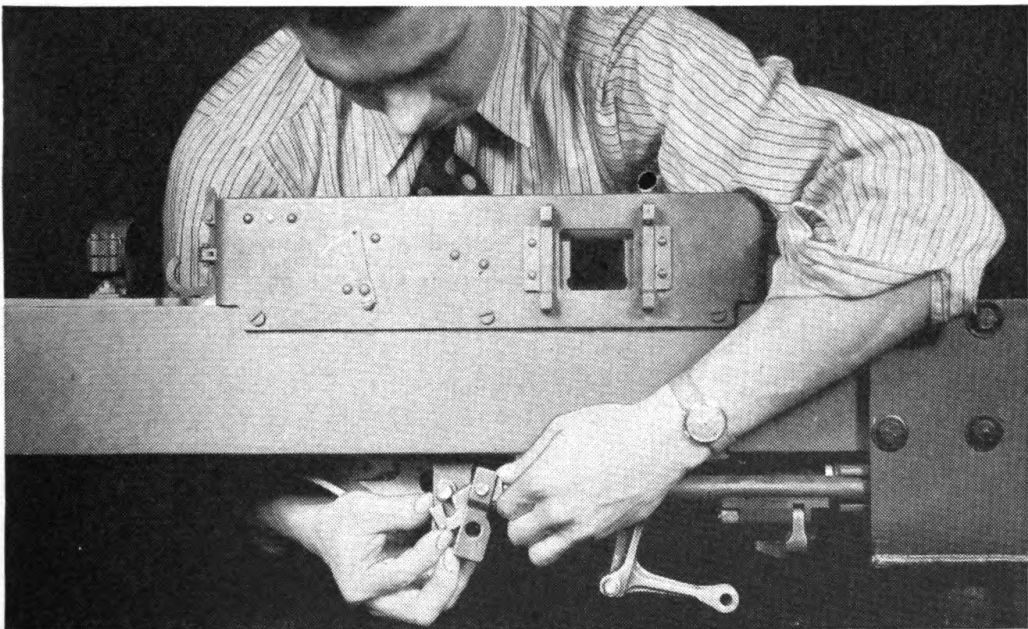


FIGURE 19.—Disconnecting driving springs from lock frame.

- (4) Back off, counterclockwise one-half turn.
- (5) With a quick snap of the wrists turn the tube into the extension.
- (6) Look into the peephole and see that the tube lock is properly engaged.
- (7) If the tube cannot be locked, it will be necessary to stone the rear face of the barrel until it will lock.

15. Back plate.—*a. To remove.*—Holding the back plate latch to the rear (fig. 2), slide the plate down and out.

b. To replace.—Insert the back plate in its slide way and push it upward until its latch is engaged.

16. Breechblock.—*a. To remove.*—(1) Retract the lock frame (fig. 20).

(2) Holding the breechblock stop depressed, catch the breechblock as it falls out (fig. 17).

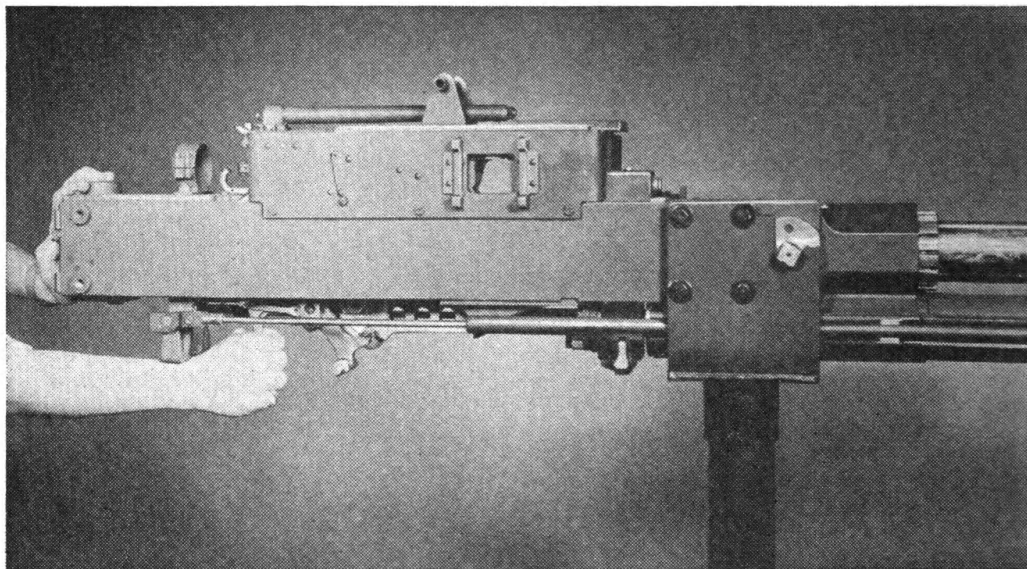


FIGURE 20.—Retracting lock frame.

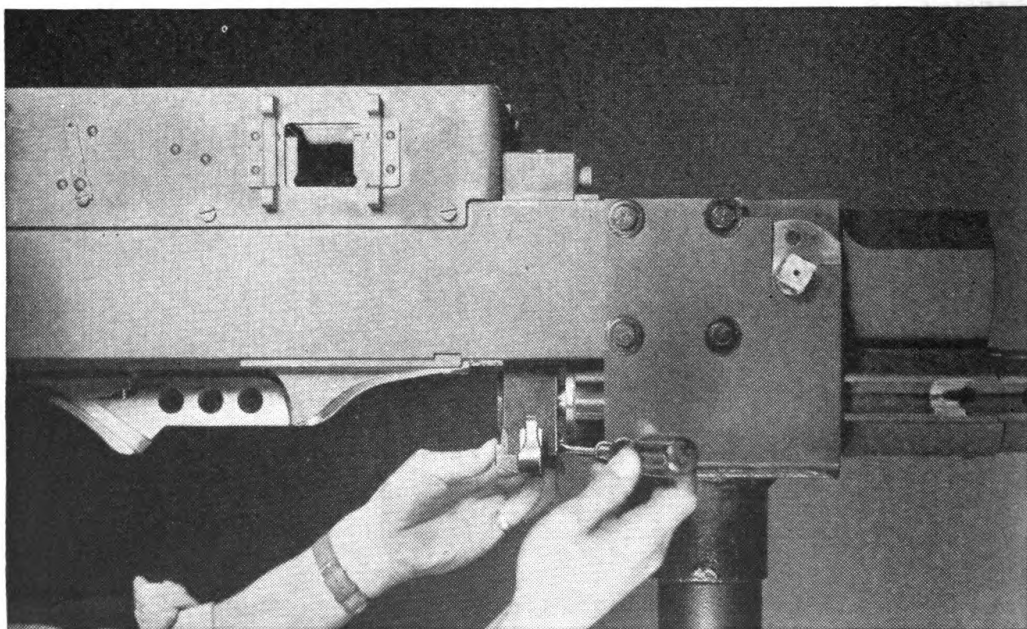


FIGURE 21.—Depressing breechblock stop.

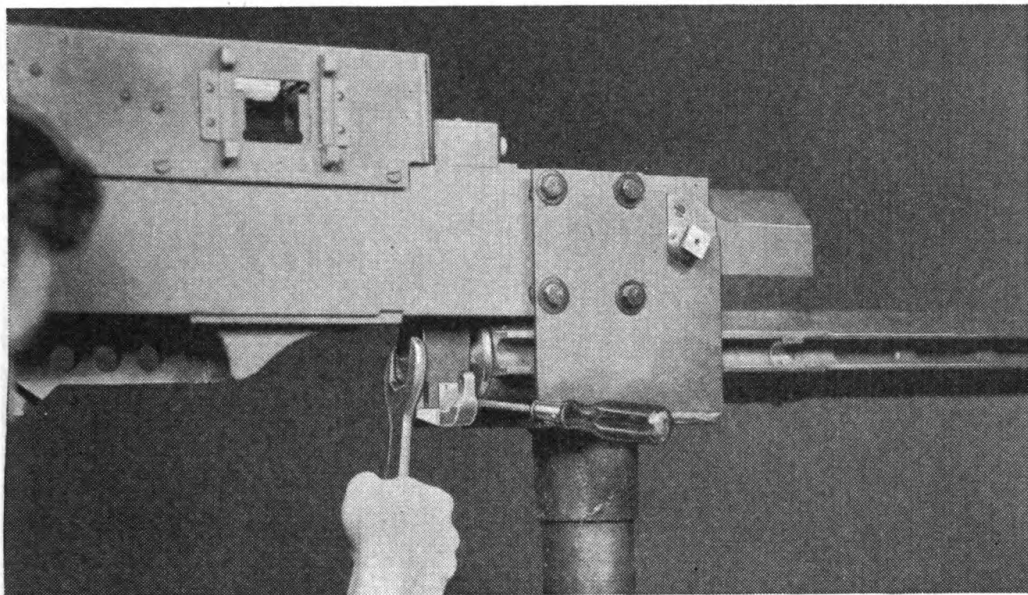


FIGURE 22.—Removing recuperator piston rod nut.

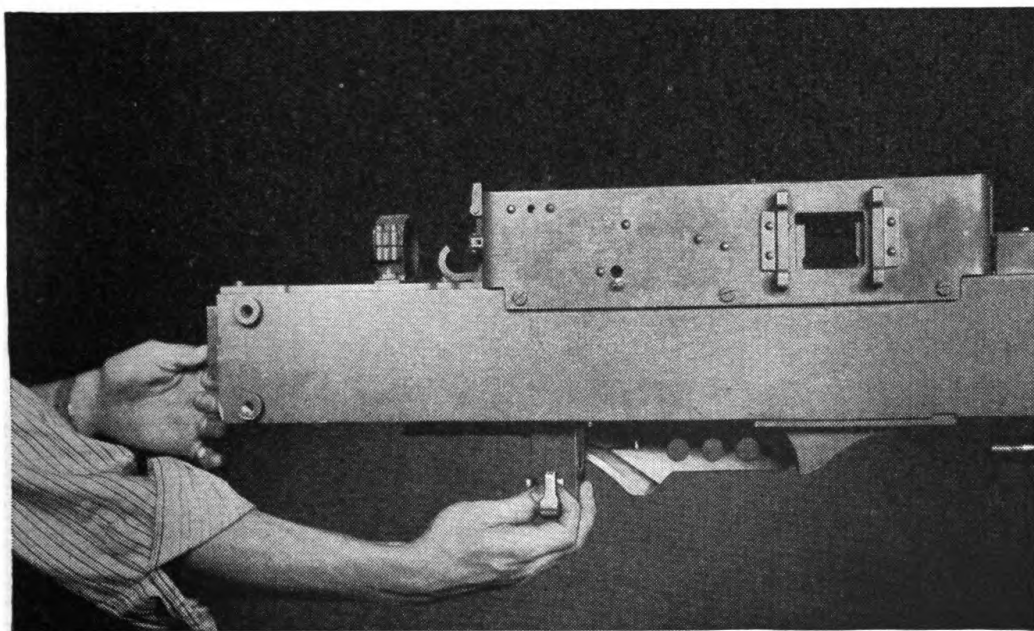


FIGURE 23.—Removing tube extension.

b. To replace.—Depress the breechblock stop and hold it depressed, while sliding the breechblock up into place.

17. Lock frame.—*a. To remove.*—(1) Remove the back plate.

(2) Disconnect the driving spring rods from the lock frame by pulling out on the driving spring rod hook safeties and depressing the driving spring rod hooks.

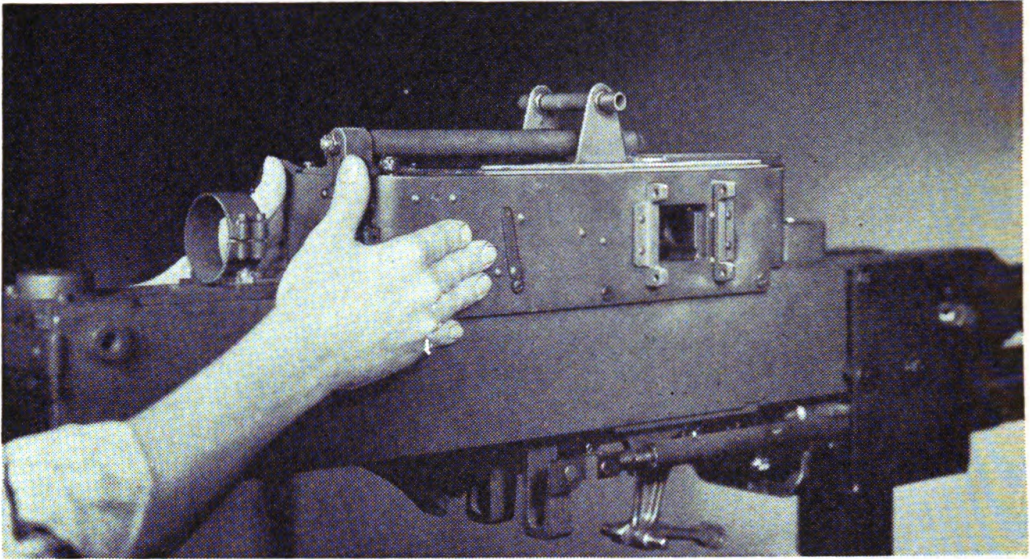


FIGURE 24.—Removing feed box cover.

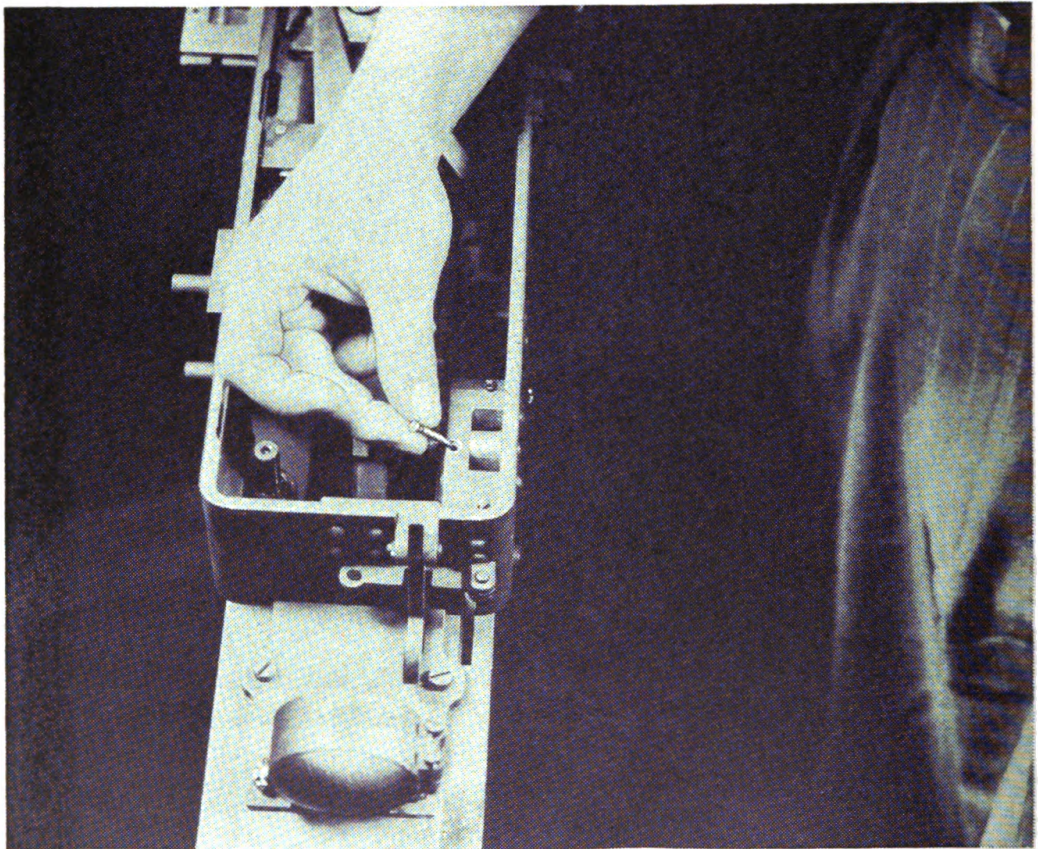


FIGURE 25.—Removing feed lever pin retainer pin.

(3) Slide out the lock frame through the rear end of the trunnion block by pulling the operating lever to the rear (fig. 18).

Caution: To ease the spring pressure on the operating lever, grasp the lock frame by the charger and allow the operating lever to move forward slowly.

b. To replace.—(1) Release the carrier catch.

(2) Rotate the operating lever to the rear and insert the lock frame in the guideway of the trunnion block.

(3) Connect driving spring rod hooks and safeties.

18. Tube extension.—*a. To remove.*—(1) Remove the lock frame, back plate, breechblock, feed lever, and carrier from the gun.

(2) Detach the driving spring hooks from the tube extension by retracting the plungers in the connections.

(3) With the breechblock stop depressed, unscrew the piston rod nut with the special wrench provided for that purpose (fig. 22).

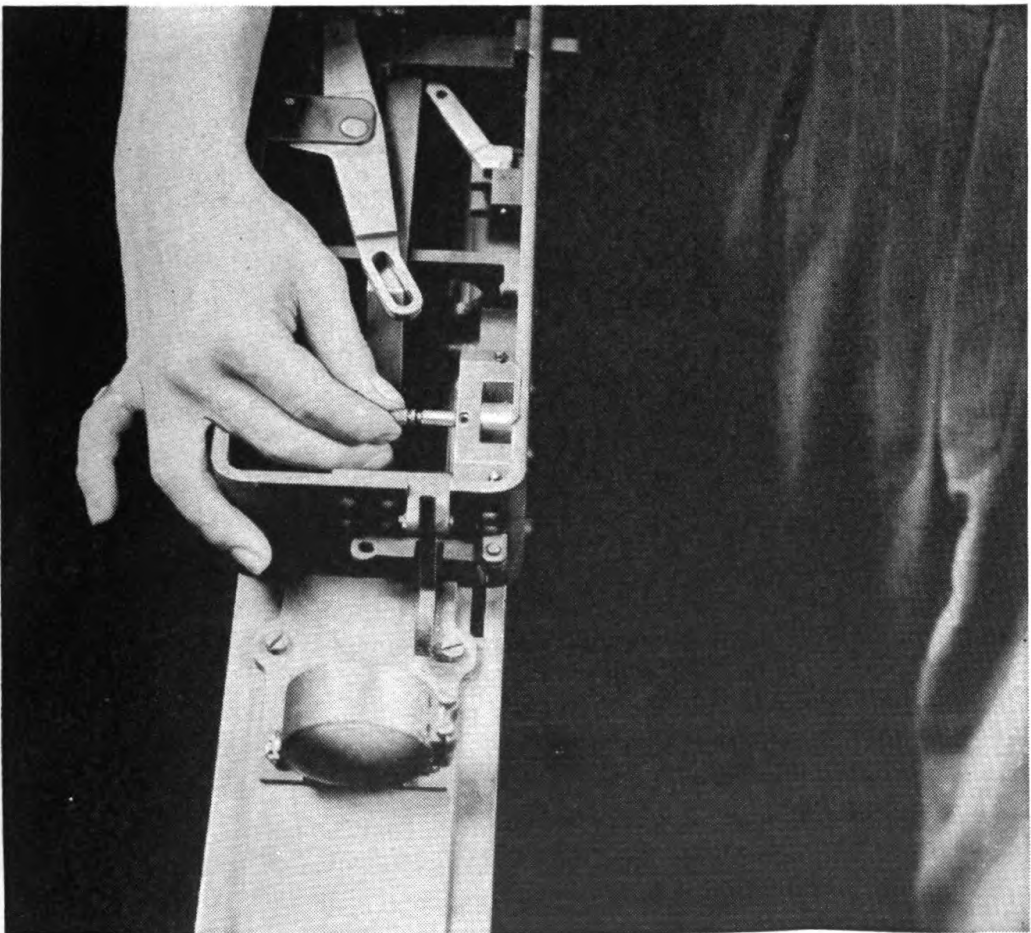


FIGURE 26.—Removing feed lever pin.

(4) Slide the tube extension out through the rear of the trunnion block (fig. 23).

b. To replace.—(1) Insert the tube extension in the rear of the trunnion block and slide it forward in its guideway.

(2) Holding the breechblock stop depressed, screw the piston rod nut on tight, making sure that one flat of the nut is in line with the top of the breechblock stop (fig. 22).

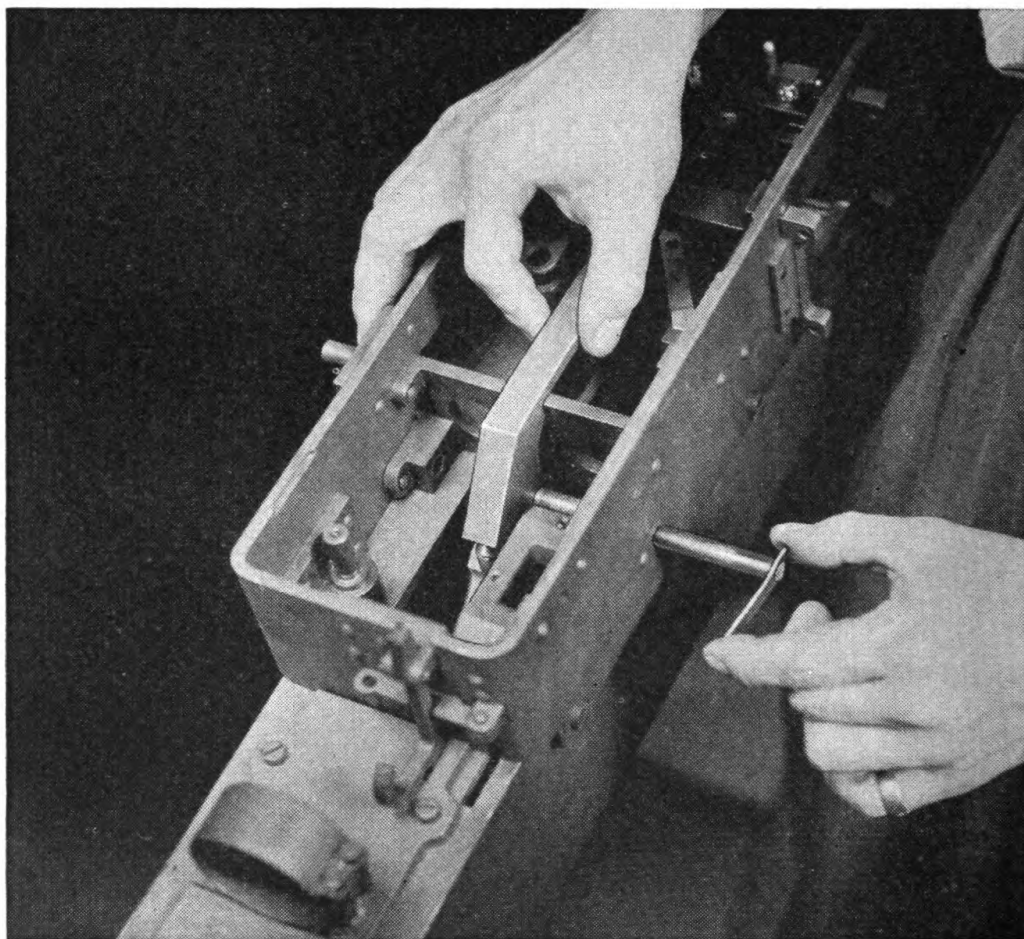


FIGURE 27.—Removing carrier pin.

(3) Holding the plungers in the connections retracted, attach the driving springs to the tube extension bracket.

19. Feed box parts.—*a. To disassemble.*—(1) Lift the feed box cover latches (fig. 24) and slide the cover forward and off.

(2) Lift out the feed crank (fig. 30).

(3) Remove the feed lever swivel (fig. 30).

(4) Lift out the feed lever pin retainer pin (fig. 25).

(5) Pull the feed lever pin out of the feed lever and remove (fig. 26).

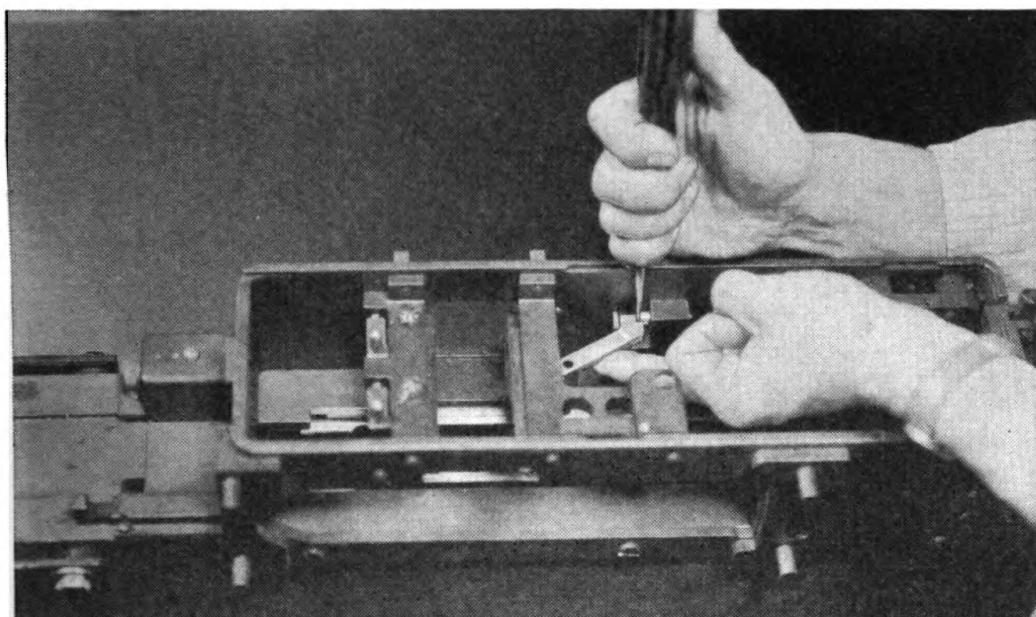


FIGURE 28.—Removing carrier catch.

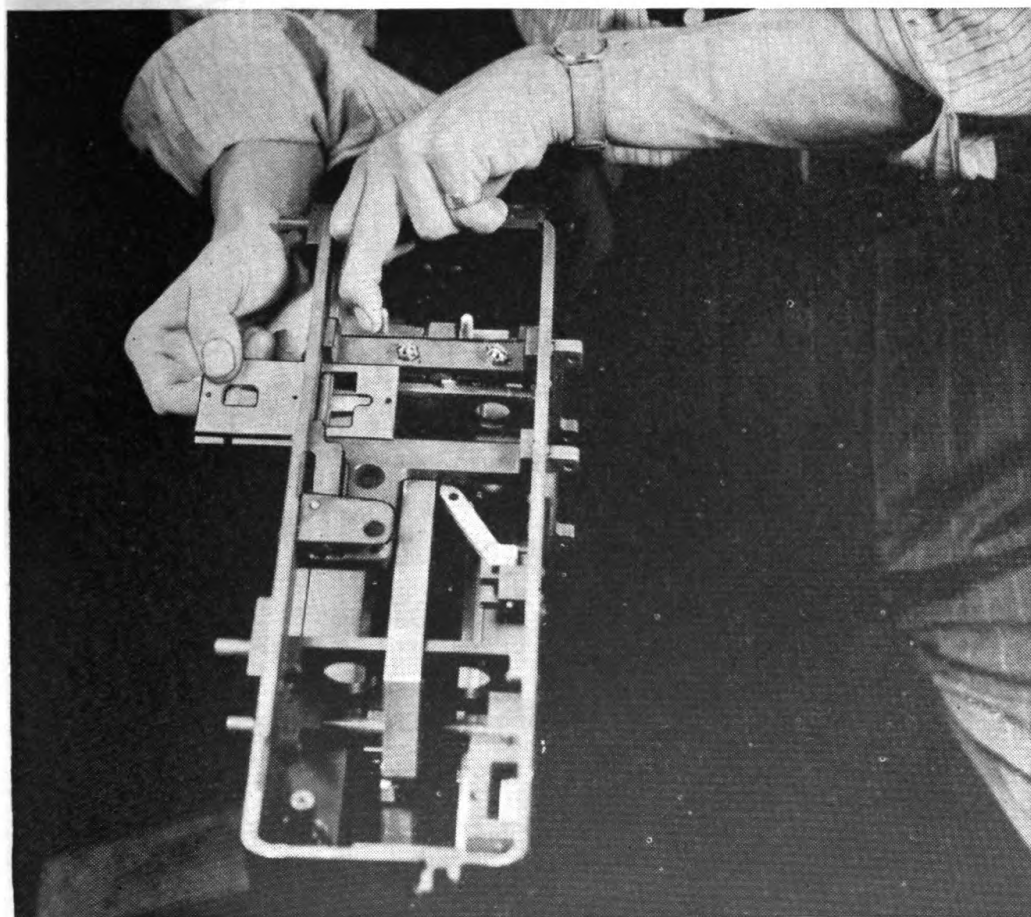
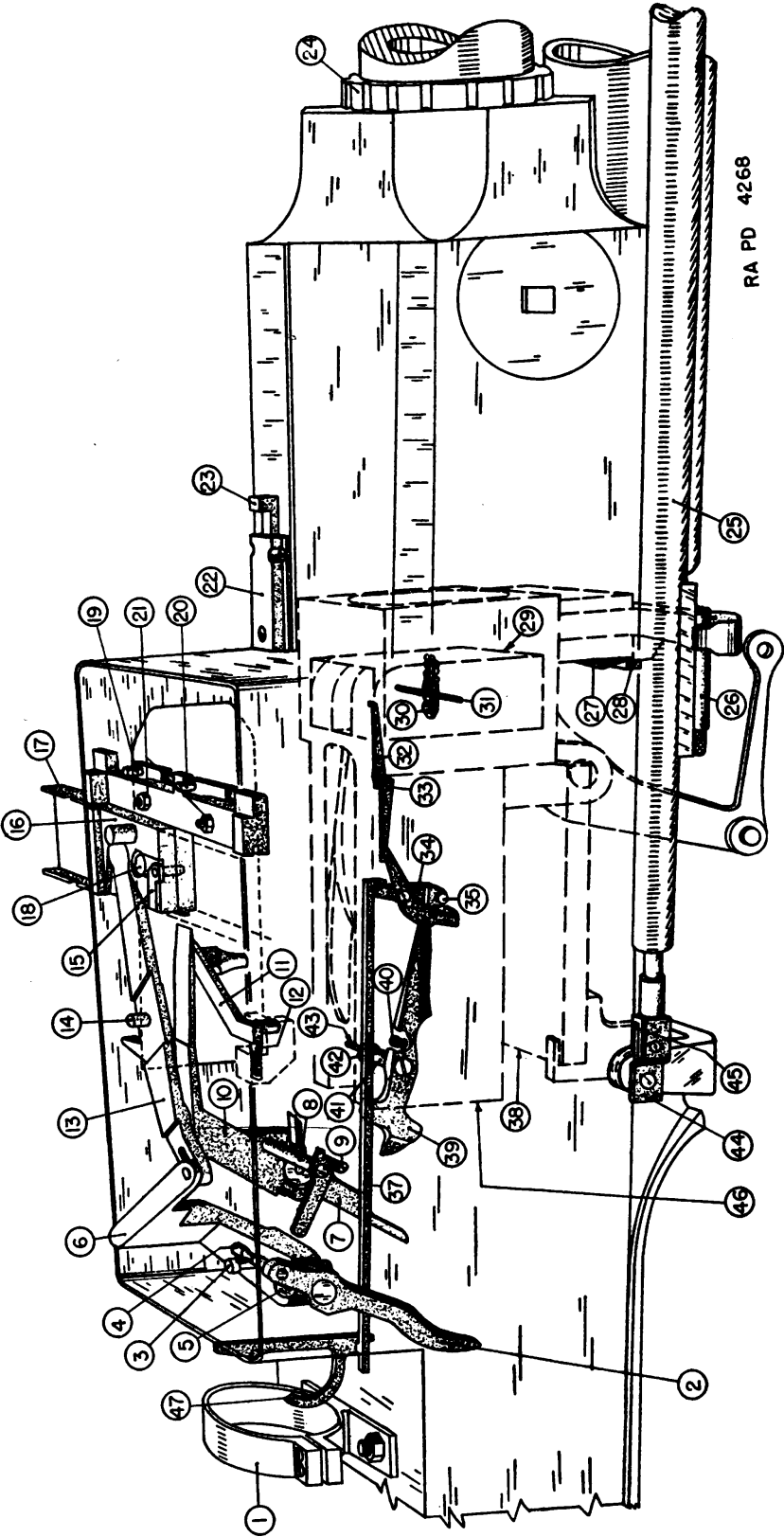


FIGURE 29.—Removing feed slide.



- | | | |
|-----------------------------------|--|--------------------------------------|
| 1. Solenoid clamp. | 17. Feed slide. | 32. Trigger trip. |
| 2. Feed lever. | 18. Feed pawl lifter stud. | 33. Trigger trip pin. |
| 3. Feed lever pin. | 19. Cartridge feeder holding pawl. | 34. Trigger lever assembly. |
| 4. Feed lever pin retainer pin. | 20. Cartridge feeder stop pawl. | 35. Trigger lever assembly pin. |
| 5. Feed lever swivel connector. | 21. Cartridge feeder pawl stud nuts (2). | 37. Trigger bar. |
| 6. Feed crank. | 22. Tube lock plate assembly. | 38. Lock frame. |
| 7. Carrier dog. | 23. Tube lock depressor. | 39. Ejector. |
| 8. Carrier pin. | 24. Trunnion block bushing. | 40. Ejector spring and plunger. |
| 9. Carrier pin lock screw. | 25. Driving spring assembly. | 41. Ejector stud. |
| 10. Carrier. | 26. Driving spring connections. | 42. Ejector stud nut. |
| 11. Carrier catch. | 27. Recuperator piston rod nut. | 43. Ejector stud nut pin. |
| 12. Carrier catch spring plunger. | 28. Breechblock stop. | 44. Driving spring rod leaf springs. |
| 13. Feed slide lever. | 29. Breechblock. | 45. Driving spring rod hooks. |
| 14. Feed slide lever pin. | 30. Firing pin. | 46. Tube extension. |
| 15. Feed slide bridge pin. | 31. Firing pin stop pin. | 47. Trigger. |
| 16. Feed slide bridge. | | |

FIGURE 30.—Feed box assembly.

- (6) Remove the feed lever (fig. 30).
 - (7) Lift out the feed slide lever pin and the feed slide lever (fig. 30).
 - (8) Loosen the carrier pin lock and pull the carrier pin out of the side of the feed box (fig. 27).
 - (9) Lift the carrier out of the top of the feed box (fig. 30).
 - (10) Holding the carrier catch plunger depressed with the point of a screw driver, lift out the carrier catch (fig. 28). Take care not to lose carrier plunger and spring.
 - (11) Remove the feed slide bridge pin by lifting up on its lock, turning it out of its recess (counterclockwise), and lifting it out (fig. 30).
 - (12) Slide the bridge to the left and lift it out (fig. 30).
 - (13) Holding the cartridge feeder holding pawl depressed, pull the feed slide out the side of the feed box (fig. 29).
- b. To assemble.*—(1) Slide the feed slide in the left side of the feed box.
- (2) Replace the feed slide bridge.
 - (3) Replace the feed slide bridge pin lock.
 - (4) Reinsert the carrier catch plunger and spring and, holding the plunger depressed with a screw driver, replace the carrier catch.
 - (5) Replace the carrier and insert its pin.
 - (6) Turn the carrier pin lock into place.
 - (7) Replace the feed slide lever and then its pin.
 - (8) Replace the feed lever and its pin.
 - (9) Insert the feed lever pin retainer pin.
 - (10) Replace the feed lever swivel.
 - (11) Replace the feed crank, making sure that the opening on the feed crank straddles the feed lever swivel and that the feed crank stud enters the slot in the feed slide lever.
 - (12) Replace the feed box cover.

20. Ejection chute.—*a. To remove.*—(1) Remove the ejection chute pin cotter pins.

- (2) Withdraw the ejection chute pins to the rear.

b. To replace.—(1) Replace the ejection chute pins.

- (2) Replace cotter pins, making sure to spread the ends of the pins.

SECTION V

DISASSEMBLY AND ASSEMBLY OF GROUPS

	Paragraph
Lock frame.....	21
Tube extension.....	22
Driving spring.....	23
Back plate.....	24

21. Lock frame.—*a. To disassemble.*—(1) Pull out the front of and press down on the extractor, making certain the spring does not fly out. The extractor will come off its axis pin (fig. 31).

(2) Insert a screw driver in the slot of the operating lever spring lock. Press slightly inward and rotate counterclockwise until the spring pressure forces the lock out (fig. 31).

(3) Pull out the spring and follower.

(4) Remove the cotter pin from the operating lever pin. Remove the operating lever pin and operating lever.

(5) Remove the cocking lever pin cotter pin.

(6) Remove the cocking lever pin. The cocking lever will fall out (fig. 31).

(7) Withdraw the sear pin cotter pin.

(8) Lift out the sear pin and remove the sear and spring (fig. 31).

(9) Remove the cotter pin in the hammer guide pin.

(10) Withdraw the hammer guide pin, holding the hand over the hammer guide in order to keep it from flying out.

(11) Remove the hammer guide, the hammer spring, and the hammer (fig. 31).

b. To assemble.—(1) Replace the sear spring and sear, inserting the pin and cotter pin.

(2) Insert hammer, hammer spring, and guide in their housing.

(3) Insert the hammer spring guide pin and cotter pin.

(4) Replace cocking lever, making certain taper end is down and concave surface is forward.

(5) Replace cocking lever pin and cotter pin.

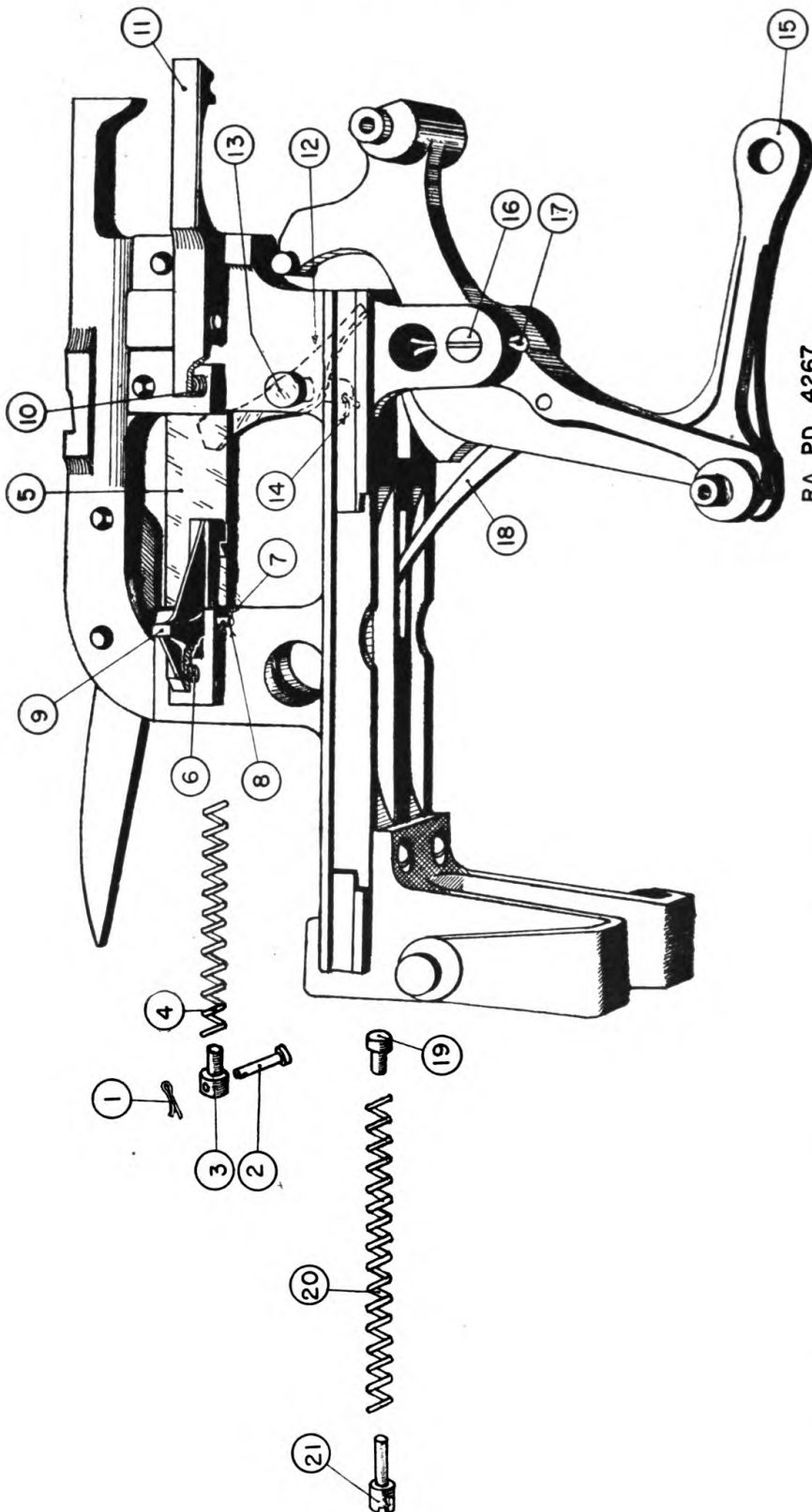
(6) Replace operating lever and insert operating lever pivot pin.

(7) Insert operating lever pivot pin and cotter pin.

(8) Insert operating lever spring follower, spring, and lock, making certain that the nose of the operating lever strut is in the recess of the follower.

(9) Insert screw driver into slot of operating lever spring lock. Press in and turn clockwise.

(10) Place extractor spring in its housing and compress it with a screw driver.



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|---------------------------------|-----------------------------------|--------------------------------------|
| 1. Hammer guide pin cotter pin. | 8. Sear pin. | 15. Operating lever. |
| 2. Hammer guide pin. | 9. Sear. | 16. Operating lever pin. |
| 3. Hammer guide. | 10. Extractor spring. | 17. Operating lever pin cotter pin. |
| 4. Hammer spring. | 11. Extractor. | 18. Strut. |
| 5. Hammer. | 12. Cocking lever. | 19. Operating lever spring follower. |
| 6. Sear spring. | 13. Cocking lever pin. | 20. Operating lever spring. |
| 7. Sear pin cotter pin. | 14. Cocking lever pin cotter pin. | 21. Operating lever spring head. |

FIGURE 31.—Lock frame.

(11) Push the extractor onto its axis pin, holding the spring compressed.

22. Tube extension.—*a. To disassemble.*—(1) Drive out breechblock stop locking pin.

(2) Unscrew breechblock stop retaining screw and remove breechblock stop and breechblock stop retaining screw spring.

(3) Depress the tube lock plate plunger and remove tube lock assembly (fig. 30).

(4) Remove tube lock and tube lock spring.

(5) Remove trigger trip pin and take out trigger trip (fig. 30).

(6) Remove trigger lever pin which releases trigger assembly, trigger lever spring, and trigger lever spring plunger.

(7) Remove ejector stud cotter pin and nut.

(8) Pull out the ejector stud, releasing the ejector, spring, and plunger (fig. 30).

b. To assemble.—(1) Insert ejector spring and plunger into its housing and replace ejector and stud on tube extension.

(2) Screw on ejector stud nut and insert cotter pin.

(3) Place trigger lever, spring, and plunger in place and insert trigger lever pin.

(4) Replace trigger trip and insert its pin.

(5) Replace tube lock and spring in its housing.

(6) Hold tube lock plate plunger depressed and insert tube lock plate into its housing.

(7) Insert breechblock stop retaining screw spring into breechblock stop. Insert breechblock stop. Screw in breechblock stop retaining screw. Replace breechblock stop locking pin.

23. Driving spring.—*a. To disassemble.*—(1) Unscrew driving spring tube and cap.

(2) Remove cotter pin and unscrew driving spring rod connection. (Hold finger on front end of housing to prevent driving spring rod from flying out.)

(3) Withdraw driving spring rod assembly, together with driving springs and driving spring spacer.

(4) Remove pin and unscrew driving spring rod piston.

(5) Remove driving spring rod hook spring and plunger from opening in front end of connection.

(6) Remove cotter pin and push out driving spring rod connection pin. This releases driving spring rod hook, driving spring rod connection, and driving rod hook safety.

(7) Remove pin and unscrew driving spring tube connection pin knob.

(8) Withdraw driving spring tube connection pin and driving spring tube connection pin spring.

b. To assemble.—(1) Insert driving spring tube connection pin spring and pin.

(2) Screw on driving spring tube connection pin knob. Insert pin and bend it.

(3) Reassemble driving spring rod connection, hook, and safety. Insert driving spring rod connection pin and replace cotter pin.

(4) Insert driving spring rod hook spring plunger and spring in opening of connection.

(5) Screw on driving spring rod piston, insert pin and bend it.

(6) Reassemble driving springs and spacer. (Make certain in assembling driving springs that the smaller diameters are toward the spacer.)

(7) Insert driving spring rod and spring into its housing and screw on driving spring rod connection. Replace cotter pin and open up its ends.

(8) Screw on driving spring tube and cap.

24. Back plate.—*a. To disassemble.*—(1) Unscrew buffer adjusting screw.

(2) Remove buffer springs (large and small) and buffer friction pieces (lower and upper).

(3) Unscrew buffer plunger stop screw.

(4) Remove buffer plunger.

b. To assemble.—(1) Replace buffer plunger.

(2) Screw in buffer plunger stop screw.

(3) Replace buffer friction pieces (lower and upper) and buffer springs (large and small).

(4) Screw in buffer adjusting screw.

SECTION VI

INSPECTION

Procedure..... Paragraph 25

25. Procedure.—The following instructions should be scrupulously observed.

*Parts to inspect in order
of inspection*

a. Gun.

Points to observe

a. General appearance; note rust, condition of paint, powder fouling, brass chips, and lubrication.

- | | |
|---------------------------|---|
| b. Back plate. | b. Remove back plate and see that its latch functions properly. |
| c. Feed box cover. | c. Open feed box cover and note that all parts of operating mechanism are free from burs and are properly lubricated. |
| d. Breechblock. | d. Remove breechblock and examine for burs or score marks. |
| e. Driving spring. | e. Retract lock frame and see that driving springs function normally. |
| f. Recuperator mechanism. | f. Elevate gun to 5°, remove filling plug, and note whether oil is at proper level (bottom of hole). |
| g. Tube lock. | g. Be sure that tube lock operates freely. |
| h. Lock frame. | h. Smoothness of operation. |

SECTION VII

MALFUNCTION AND CORRECTION

Paragraph

Malfunction and correction 26

26. Malfunction and correction.

<i>Malfunction</i>	<i>Cause</i>	<i>Correction</i>
a. Fails to fire, no percussion on primer.	a. Broken firing pin or spring.	a. Replace breechblock (par. 16).
b. Cartridge case fails to extract.	b. Broken or weak extractor spring.	b. Replace with new spring or extractor (par. 21).
c. Lock frame fails to function. Hammer not held in cocked position.	c. Broken sear spring.	c. Replace with new sear spring (par. 21).
d. Operating lever fails to return to forward position.	d. Broken or weak operating lever spring.	d. Replace with new spring (par. 21).
e. Ejector fails to function.	e. Broken or weak ejector spring, or insufficient recoil.	e. Replace with new ejector spring (par. 22).
f. Insufficient recoil.	f. Excess oil in recoil mechanism.	f. Adjust oil in recoil mechanism.

SECTION VIII

CARE AND PRESERVATION

	Paragraph
General.....	27
Inspection.....	28
Removal of parts with gun mounted in airplane.....	29
Lubrication instructions.....	30
Recuperator.....	31
Cleaning.....	32
Cleaners and abrasives.....	33
Preservatives.....	34

27. General.—Because of the extremely low temperatures prevailing at all times at high altitudes, special care must be taken to see that aircraft gun lubricants be kept free flowing. Grease, dried oil, and gum must be carefully removed, and the gun must be relubricated with oil, lubricating, for aircraft instruments and machine guns, U. S. Army Specification No. 2-27 of the latest issue, before it is reassembled.

28. Inspection.—The guns should be inspected at least once each 24 hours. If the action appears dry, or dirt or other foreign matter is present, remove the gun, slush out the tube, clean the breechblock, relubricate, and reassemble. Always check the action manually before releasing the gun for its next firing mission.

29. Removal of parts with gun mounted in airplane.—All removal of parts necessary for cleaning may be done with the gun mounted in the P-39 airplane. The only special considerations are as follows:

a. The tube must be removed through the propeller hub.

b. The removal of the tube extension can be accomplished only after the removal of the radio relay box on the airplane fire wall just back of the gun.

30. Lubrication instructions.—*a.* The proper functioning of the gun depends to a great extent on proper lubrication. Particular attention should be given to the lubrication of sliding surfaces of the operating mechanism and other bearing surfaces.

b. Grit must be kept out of the lubricant and lubricating openings. In cleaning sliding surfaces, do the necessary wiping with a piece of firm cloth. No lint should be allowed to remain in any orifice or on sliding parts.

c. Oil should be applied while the parts are being maneuvered to insure proper distribution of lubricant to all moving parts.

d. When cleaning, care must be taken to insure the complete removal of all residue or sediment and to prevent entrance of dirt or other foreign matter.

e. Oil, lubricating, for aircraft instruments and machine guns, U. S. Army Specification No. 2-27 of the latest issue, should be used for lubricating the 37-mm automatic gun at all temperatures when the gun is to be fired.

f. Oil, lubricating, for aircraft instruments and machine guns affords little protection against corrosion or rusting. When so used, it should be renewed at least every 24 hours. If the gun is to be out of service for longer than 1 week, all parts should be protected with oil, engine, SAE 30. When the gun is to be placed in service again the engine oil should be entirely removed and the parts lubricated with oil, lubricating, for aircraft instruments and machine guns, U. S. Army Specification No. 2-27 of the latest issue.

g. *Lubrication chart.*—The following chart gives the location, lubricant, method of application, and frequency of lubrication for the 37-mm aircraft gun:

Location	Lubricant	How applied	Frequency
Bore and chamber.	Oil, lubricating, for aircraft instruments and machine guns.	Sponge-----	Once every 24 hours if gun is being fired regularly, or if inspection shows that action is dry. Do.
Receiver	-----do-----	Oiled cloth-----	

31. Recuperator.—To add recoil oil to the recuperator, elevate the gun to 5°. (This is approximately the angle at which the gun rests in the Bell P-39 Airacobra when this airplane is on the ground.) Remove the filling plug, and pour recoil oil, U. S. Army Specification No. 2-36D, slowly into the recuperator cylinder until it is visible in the bottom of the filling hole. Slap the outside walls of the recuperator with the hands. This action will force the escape of any air trapped in the cylinder. Continue filling and jarring the cylinder until all air is removed and the oil remains stationary at the bottom of the filling hole. Reinsert the filling plug.

NOTE.—Use of any oil other than oil, recoil, U. S. Army Specification No. 2-36D, in the recuperator is strictly prohibited.

32. Cleaning.—When the gun has been fired, the bore should be cleaned with warm water once every 24 hours before relubrication.

33. Cleaners and abrasives.—The following are prescribed:

a. Cloth, crocus (or its equivalent).—Used for cleaning and polishing finished surfaces such as breechblocks and firing mechanisms.

b. Cloths, wiping, cotton, mixed, sterilized.—Used for wiping machinery.

c. Lime, hydrated.—Used in cleaning solution.

d. Polish, metal, paste.—Used for polishing bright (unlacquered) parts.

e. Soda ash.—Used in solution for cleaning bores.

f. Soda, caustic (lye).—For cleaning purposes; used to quicken the action of cleaning compounds.

g. Solvent, dry-cleaning.—Used for cleaning polished metal surfaces.

h. Sponges.—Used for washing and cleaning matériel. Cellulose sponges may be substituted for natural sponges in sizes Nos. 4, 6, 8, and 10 (approximate dimensions, in inches are, respectively: 1¼ by 3⅛ by 4⅝, 1⅝ by 3¼ by 5¼; 2 by 3⅞ by 6¼; 2½ by 4⅝ by 6½). These latter sponges must not be wrung. Squeezing only is the proper method. See TM 9-850 for detailed application of cleaners and preservatives.

34. Preservatives.—See TM 9-850 for information on rust, corrosion, inspection for corrosion, rust preventives, preparation of metal surfaces for slushing, method of slushing, inspection of grease films, and storage conditions.

SECTION IX

AMMUNITION

	Paragraph
General.....	35
Classification.....	36
Identification.....	37
Model.....	38
Ammunition lot number.....	39
Ammunition data card.....	40
Painting and marking.....	41
Care, handling, and preservation.....	42
Authorized rounds.....	43
Preparation for firing.....	44
Packing.....	45

35. General.—Ammunition for the 37-mm automatic gun M4 is issued in the form of fixed complete rounds that are fed into the gun as a unit. The cartridge case, which contains the propelling

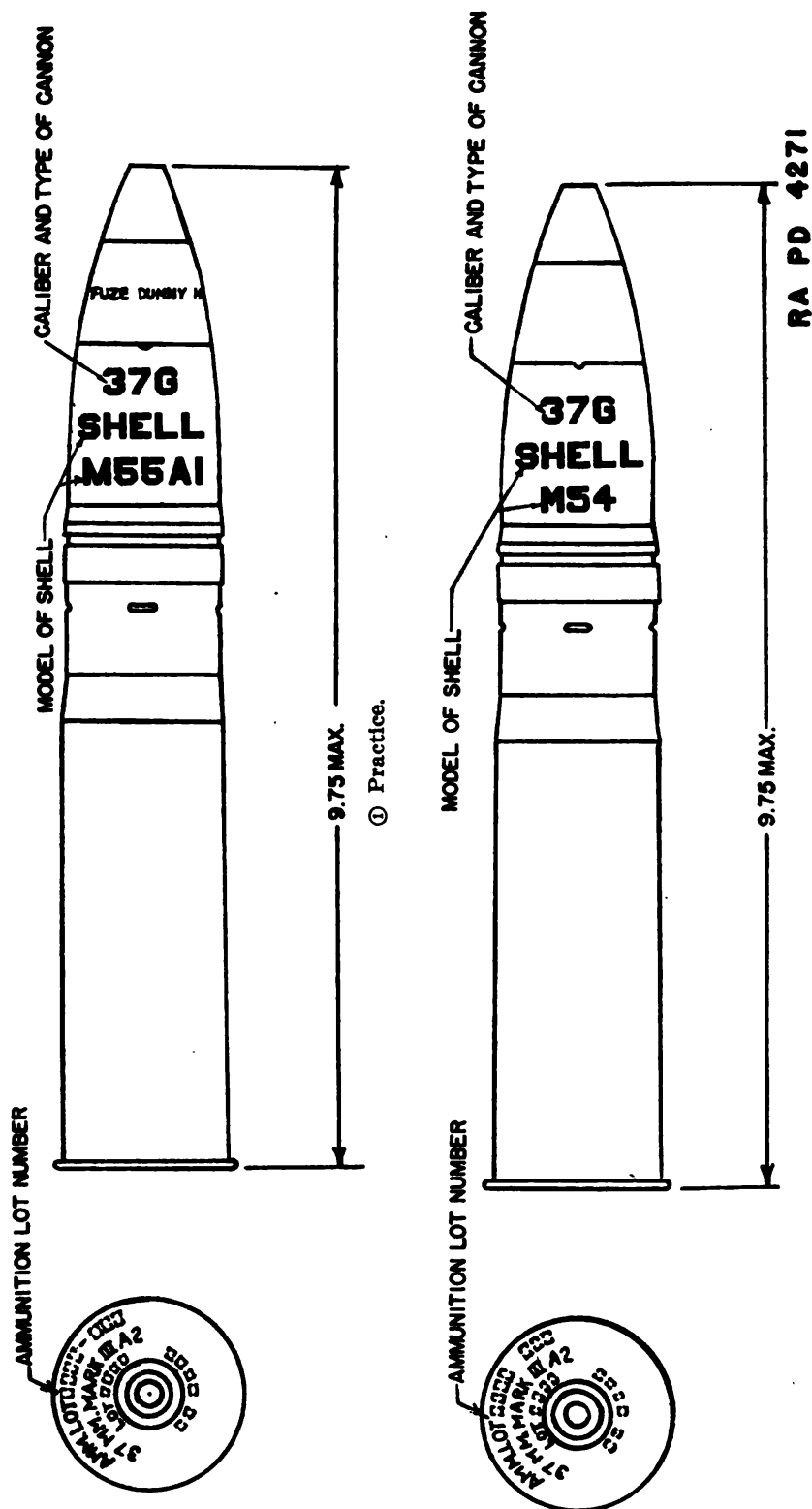


FIGURE 32.—Shell.

charge and primer, is crimped rigidly to the fuzeed projectile. The fuze is of the impact type. After firing, the cartridge case is extracted and ejected automatically, and the gun is then ready for the next round.

36. Classification.—The ammunition provided for use in this gun is classified according to type as high explosive and target practice. The high explosive projectile contains a high explosive filler, whereas the practice projectile contains no filler. Both have tracers. The tracer in the high explosive projectile is known as a shell-destroying tracer because it is so arranged that should the projectile fail to strike the target and function, the tracer upon burning through will destroy the shell.

37. Identification.—Ammunition, including components, is completely identified by means of the painting, marking (fig. 32), and accompanying ammunition data card.

38. Model.—To identify a particular design, a model designation is assigned at the time the design is classified as an adopted type. This model designation becomes an essential part of the standard nomenclature of the item and is included in the marking on the item. The present system of model designation consists of the letter M followed by an Arabic numeral. Modifications are indicated by adding the letter A and the appropriate Arabic numeral. Thus, M55A1 indicates the first modification of an item for which the original model designation was M55.

39. Ammunition lot number.—When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number is stamped or marked on each loaded complete round, on all packing containers, and on the accompanying ammunition data card. It is required for all purposes of record, including reports on condition, functioning, and accidents in which ammunition is involved. To provide for the most uniform functioning, all of the rounds of any one lot of fixed ammunition consist of—

Projectiles of one lot number.

Fuzes of one lot number.

Primers of one lot number.

Propellant powder of one lot number.

Therefore, to obtain the greatest accuracy in any firing, successive rounds should be from the same ammunition lot, whenever practicable.

40. Ammunition data card.—A 5- by 8-inch card, known as an ammunition data card, is packed in each packing box with the am-

munition. When required, assembling or firing instructions are printed on the reverse side of the card.

41. Painting and marking.—*a.* All projectiles are painted to prevent rust and by means of the color to provide a ready means for identification as to type. The color scheme is as follows:

High explosive-----	YELLOW
Practice-----	BLUE (projectile may be inert or may contain a live fuze with spotting charge of black powder).

b. In the case of packing boxes, a blue band painted thereon indicates that the box contains practice ammunition.

c. Marking.—(1) The following information is stenciled on the projectile (fig. 32):

- (a) Caliber and type of cannon in which fired.
- (b) Model of projectile.
- (c) Lot number of loaded projectile.

Because the lot number of the loaded projectile is ordinarily not required after the complete round has been assembled, it is stenciled below the rotating band, in which position it is covered by the neck of the cartridge case.

(2) The following is stenciled in black on the base of the cartridge case:

- (a) Caliber and type of cannon in which fired.
- (b) Powder lot number.
- (c) Muzzle velocity in feet per second.
- (d) Ammunition lot number and loader's initials.

42. Care, handling, and preservation.—*a.* Complete rounds and ammunition components are packed to withstand conditions ordinarily encountered in the field. Nevertheless, since explosives are adversely affected by moisture and high temperature, due consideration should be given to protect the ammunition from such conditions.

b. Explosive ammunition must be handled with appropriate care at all times. The explosive elements and primers and fuzes are particularly sensitive to undue shock and high temperature.

c. Do not break moisture-resistant seal until ammunition is to be used.

d. Do not attempt to disassemble any complete round or any fuze.

e. Do not allow the ammunition to be exposed to the direct rays

of the sun for any length of time. More uniform firing is obtained if the rounds are at the same temperature.

f. The complete round should be free of any foreign matter—sand, mud, grease, etc., before use. If it gets wet or dirty wipe it off at once.

g. Do not remove protection or safety devices from fuzes until just before use.

h. Rounds prepared for firing but not fired will be returned to their original packings and appropriately marked. These will be used first in subsequent firing in order that stocks of opened packings may be kept at a minimum.

i. Do not handle duds. Report them to ordnance personnel for disposal.

43. Authorized rounds.—Ammunition authorized for use in this gun is shown in the following table. It will be noted that the designation completely identifies the ammunition as to type and model of projectile and fuze, as well as the caliber and model of gun in which fired.

Ammunition for 37-mm automatic gun M4

Nomenclature	Prescribed fuzes		Approximate weight of projectile (pounds)
	Model	Action	
<i>Service ammunition</i>			
Shell, fixed, HE, M54, w/SD tracer and PDF M56, 37-mm automatic gun, M4 ¹ .	M56--	Supersensitive --	1. 34
<i>Target practice ammunition</i>			
Shell, fixed, practice, M55A1, w/tracer and fuze dummy, M50, 37-mm automatic gun M4.	M50---	Inert-----	1. 34

¹ SD—Shell destroying.

PDF—Point detonating fuze.

44. Preparation for firing.—The complete rounds as issued are ready for firing, it being necessary only to load the rounds into the feeder or magazine provided with the gun, as described in section III.

45. Packing.—Twenty rounds are packed in a sealed metal-lined packing box. Representative data for estimating weight and volume requirements are listed in paragraph 2.

SECTION X

ORGANIZATION SPARE PARTS AND ACCESSORIES

	Paragraph
Organization spare parts.....	46
Accessories	47

46. Organization spare parts.—A set of organization spare parts is supplied to the using arm for field replacement of those parts most likely to become broken, worn, or otherwise unserviceable. The set is kept complete by requisitioning new parts for those used. Organization spare parts are listed in pertinent Standard Nomenclature Lists.

47. Accessories.—*a.* Accessories include tools and equipment required for such disassembling and assembling as the using arm is authorized to perform, and for the cleaning and preservation of the gun carriage, sighting and fire control equipment, ammunition, etc. They also include chests, covers, tool rolls, and other items necessary to protect the matériel when it is not in use, or when traveling. Accessories should not be used for purposes other than as prescribed, and when not in use should be properly stored.

b. There are a number of accessories whose names or general characteristics indicate their use. Others, embodying special features or having special uses, are described below.

(1) Trunnion block bushing wrench, which has a large round jaw for engaging the trunnion block bushing.

(2) Strap pipe wrench, which is used to unscrew the tube.

APPENDIX

LIST OF REFERENCES

1. Standard Nomenclature Lists.

Ammunition, fixed, all types, for pack, light, and medium field artillery-----	SNL R-1
Cleaning, preserving, and lubricating materials---	SNL K-1
Gun, automatic, 37-mm, M4-----	SNL A-46

Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index"----- OPSI

2. Technical Manuals.

Ammunition, general (now published as TR 1370-A)-----	TM 9-900
Cleaning, preserving, and lubricating materials--	TM 9-850

[A. G. 062.11 (2-7-42.)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

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(For explanation of symbols see FM 21-6.)

